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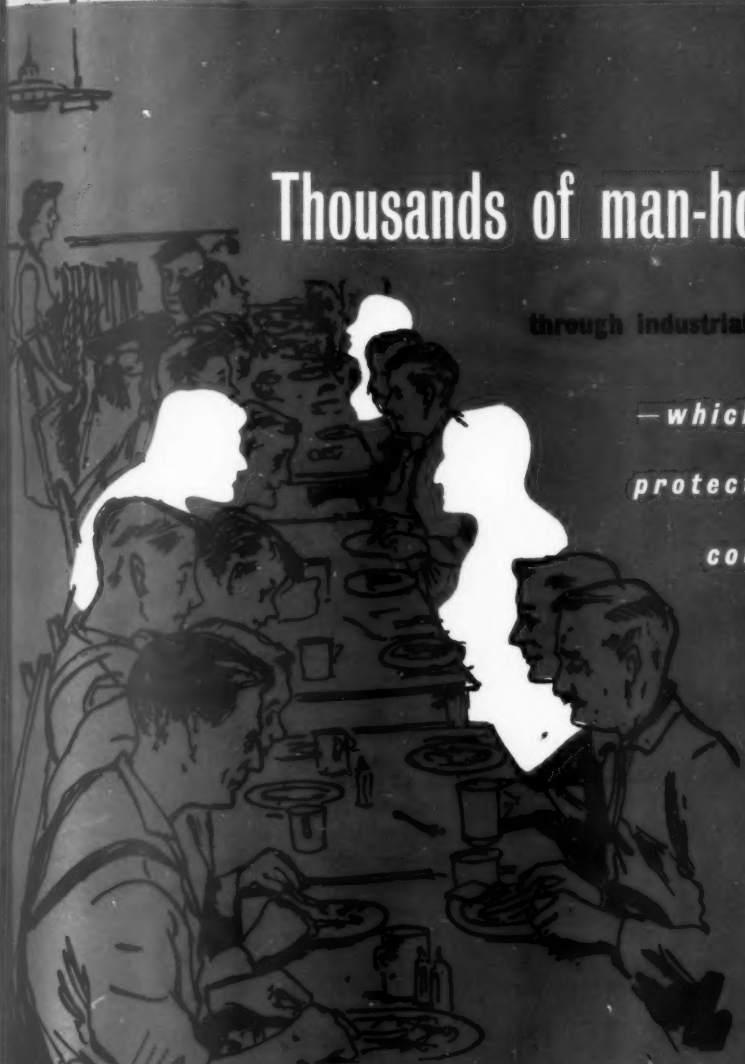

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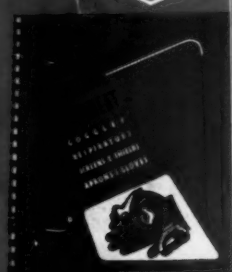

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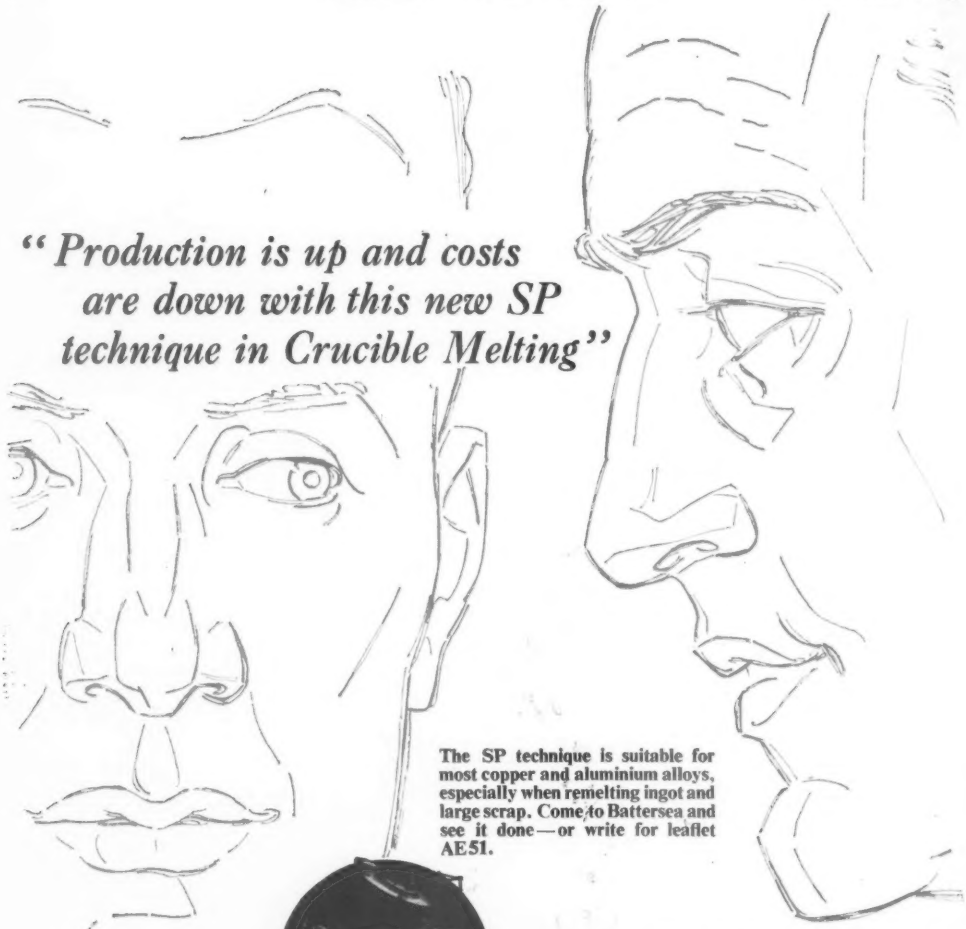

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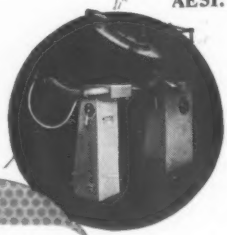

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FOUNDRY TRADE JOURNAL

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PRINCIPAL CONTENTS

Technical :

PAGE

Design, Construction and Running of a Water-cooled Balance-Blast Cupola and its Performance Compared with a Similar Brick-lined Cupola, by W. Y. Buchanan . 497

British Cast Iron Research Association: Report of the Association's activities during the year ending June 30, 1956 . 509

Hallsworth Automatic Moulding Unit: Description of plant installed at Platt Malleable Castings, Limited . . 517

Features :

Leader: Decibel Reduction 493
Featuring . . . W. Scott . . . 494, 495
Correspondence 496
Forthcoming Events 521

Commercial :

New Patents 513
Company News 516
Contracts Open 521
Raw Material Markets 522
Current Prices of Iron, Steel and Non-ferrous Metals 524

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Decibel Reduction*

We have for a long time resisted the temptation to write about nuisance from noise. Yet noise must be popular with some householders as, all day long, their radios contribute their quota to the number of decibels already existing in the neighbourhood. These somewhat selfish people are the type who are the first to protest at the noise emanating from the local works—when it is brought to their notice by the daily Press. Our first experience of the noise nuisance was many years ago, when we were invited to a non-ferrous foundry on the south side of the Thames. It appeared that on the side of the road facing the fettling shop there was a home for aged people or the like. With the help of experts from the National Physical Laboratory, the noise was confined by the use of acoustic insulation material applied to the room where fettling was carried on, and everybody was happy.

Now we read in *Gray Iron News* that in America, the noise problem has been broken down in a way similar to that of the dust problem in this country—that is by tackling it at its source. It all happened in the fettling shop of one of the Allis-Chalmers plants, where the noise was being created by the tumbling barrels, filling the hoppers of the mechanical shotblast cleaning plant, grinding machines and the placing of castings in trays. The tumbling barrels were treated by installing noise baffles in front of them and vibration isolators were placed between the feet of the machine and the floor. The insides of the barrels were sprayed with a ¼-in. coating of a rubber-base sound-deadener, whilst the outside received ¼-in. coating. The hoppers feeding the shotblast apparatus were lined with a layer of soft wood, a second one of oak and a third of perforated steel sheet, whilst the outside was sprayed with a coating of the rubber-base sound-deadener. For the grinders, washers of a commercially available material made up of fabric and rubber were installed between the wheel and its arbour, and between the workrest and the grinder. For the trays, a two-inch layer of sand was placed in the bottom, whilst the outside carried a coat of the rubber-based sound-deadener. The biggest item was of a general character; this was the installation of glass-fibred, plastic-lined sound-absorbing baffles in the ceiling area.

The complete cost of all these changes was—under American conditions—something of the order of £930. The overall improvement was the reduction of the average decibel reading from 100 to 89. Just what that means, we are unable to envisage, but at eleven per cent. it might mean the replacement of a nuisance by quite tolerable conditions. The important aspect of this development is the possibility of breaking down the problem.

* A decibel, the standard unit of noise, can best be related to well-known sounds, for example, the noise of an ordinary typewriter in a small office will be about 90 decibels.

Featuring . . . .

W. SCOTT, O.B.E., J.P., M.I.Mech.E.

MR. SCOTT, the managing director of Armstrong Whitworth (Metal Industries), Limited, and Jarrow Metal Industries, Limited, served his time as engineering apprentice at the Openshaw works of Sir W. G. Armstrong, Whitworth & Company, Limited. Like so many of his contemporaries, his training was interrupted by wartime service, as an infantryman in the Manchester Regiment. It was in 1920 that Mr. Scott went to Tyneside for a three-weeks' assignment to plan an iron foundry, but after 35 years he is still there, having passed through various managerial posts to attain his present position. Since 1929, Mr. Scott has been an enthusiastic member of the Institute of British Foundrymen and presided over the Newcastle branch in 1932. His firm has a wide interest in foundry practice as manufacturers of rolls and steel castings and, in recent years, of spheroidal-graphite cast iron. Mr. Scott pioneered the Sesci furnace—a rotary, pulverized-fuel-fired unit—for the making of steel castings under commercial conditions. Such was its success that a foundry was created based on this method of melting. Later, Mr. Scott arranged the installation of three large electric-arc melting furnaces, then quite novel, in a subsidiary company. This development work resulted in his giving a number of lectures in the major steelmaking centres.

In 1917, Mr. Scott held the position of managing director of the newly-formed Jarrow Tube Works, Limited, a concern which was taken over by Tube Investments, Limited, Mr. Scott remaining as local chairman. In 1944, he was awarded the Order of the British Empire in recognition of his contribution to the war effort. A few years later found him fighting a by-election at Jarrow. He did well, but the existence of large mining areas within the constituency created an almost insoluble proposition. Mr. Scott is on the executive of the British Steel Founders' Association and has been a member of the Research Council of the British Steel Castings Research Association since its inception.

Mr. Scott enjoys a number of hobbies, mostly of the outdoor type. He is a golfer, a keen gardener, an amateur photographer, plays bowls and presides over the local Rugby football club. His indoor recreation is music and he is an accomplished pianist and organist. His public works include the duties of a magistrate, and many committees covering employment, politics, and the like. Despite all these activities, Mr. Scott has travelled widely in connection with his business.

W. SCOTT, O.B.E., J.P., M.I.Mech.E.

Managing director, Armstrong Whitworth (Metal Industries) Limited, and Jarrow Metal Industries, Limited

Correspondence

"A STEP IN THE RIGHT DIRECTION"

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—With reference to your leading article under the above heading, in your issue of October 25, the second sentence in the second paragraph might perhaps be amplified and put in a way which would make your point clearer, and I should be grateful if you would allow me to do this.

The position really is that under the present Constitution of the Council of Ironfoundry Associations, representation would not be halved. This is because, assuming that there were the same number of member-firms in the new body as in the two Federations which have joined forces, their joint entitlement to seats on the Council would remain the same.

B. H. TRIPP,
Information and Press Officer.
Council of Ironfoundry Associations,
14, Pall Mall, London, S.W.1.

A BIBLICAL FOUNDERS' PIECE

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—The illustration on p. 445 of your issue dated October 18, under this title, represents a magnificent example of early bronze casting. Unless, however, Mr. Robb has evidence which he has not included in his description, I feel rather doubtful whether his inferences concerning its origin and method of moulding are necessarily correct. It looks to me like a typical example of *cire perdue* work, and if so his remarks concerning "core" casting become superfluous. Moreover, the fact that the votive stand was found in the Holy Land is, in itself, no proof that it was made by a Hebrew founder. The design would not, I fancy, appeal to the Hebrew mind, for it was contrary to custom and precept to represent human beings, much less deities, in "graven images." The subject, too, is in conflict with the established religion of the country. For such reasons it seems probable that the article was imported from a neighbouring pagan realm.—Yours, etc.,

E. VOSE.
Senior Metallurgist.
Copper Development Association,
Kendals Hall, Radlett, Herts.

IBF Conference 1958

The East Midlands branch of the Institute of British Foundrymen has obtained approval from the general Council of the Institute of a modification of the time and duration of the conference for 1958, which is expected to be held in Buxton, under the auspices of the East Midlands branch. The conference has been arranged earlier in the year, to commence on the Tuesday mid-day, May 13, and end on the following Friday evening as usual. It is proposed that the extra half a day be taken up with works visits so that a full day and a half will be spent on them.

GOOD PROGRESS is being made in the building of an extension to the south-east frontage of Glasgow University for the accommodation of the department of heat engines, electrical engineering, naval architecture and aeronautics. The expansion of other sections in the engineering department, such as civil engineering, mechanics and hydraulics, will be made in accommodation thus freed in the existing building.

Vitreous Enamelling Development Council

For some time, it has been felt by many in the enamelling industry that active steps should be taken to promote the interests of the industry generally in developing new uses and applications of vitreous enamels to counter the considerable competition being met from new products and finishes.

Accordingly, at a recent meeting in Birmingham, a draft memorandum of association for a new body to be known as the Vitreous Enamelling Development Council was approved. The Council will be concerned exclusively with the promotion and extension of the uses of vitreous enamel as a finish and will not in any way conflict with the Institute of Vitreous Enamellers which is primarily a technical and scientific body. Support is actively sought, as it is felt that only by the most energetic steps can the competition of other finishes be met and a greater share of new and developing markets be obtained.

The Council is at present being registered and, at an early date, a general meeting will be called. It is hoped that support will be forthcoming in this effort to see that the industry continues to expand and prosper.

Forty Years Ago

In the November, 1916, issue of the JOURNAL, there was the first editorial mention as to the possibility of the reclamation of moulding sands. The membership of the American Foundrymen's Association was reported as being 974. It also disclosed a method of melting borings in the cupola, by filling up a stove pipe with them. Amenities for the workmen were beginning to have attention—one firm had installed a comfortable mess-room with reading matter, overalls were supplied and there was ample laboratory accommodation. At this time, Kryn & Lahy, at Letchworth, had a properly organized canteen. Amongst new companies registered appear the names of Taylor Bros. (Sandiacre), Limited, Alfred H. Mould & Sons, Limited, Walsall, and Wadkin, Mills & Company, Limited—later, in 1935, to be changed to Wadkin, Limited.

British Steel Founders' Association

A customer/founder convention is to be held at the Café Royal, Regent Street, London, W.1, on November 14. Three papers are to be presented. The authors are Dr. S. F. Dorey, C.B.E.; Mr. A. C. Annis of Metropolitan-Vickers Electrical Company, Limited, and Dr. C. J. Dadswell. The conference is to be opened by the chairman of the Association, Mr. G. M. Menzies. It will finish at 4 p.m.

John Rennie

For those readers interested in the history of engineering and engineers, a paper by Dr. C. T. G. Boucher on "John Rennie" is enthusiastically commended. It was presented last week to a meeting of the Manchester Association of Engineers. Copies of the paper are available from the secretary of the Association, 20 Booth Street, Manchester, 2, at a cost of 2/6 each.

THREE HUNDRED MEMBERS of the Refractories Association of Great Britain and their friends attended the annual ball at the Victoria Hotel, Sheffield, on October 26.

Design, Construction and Running of a Water-cooled Balanced-Blast Cupola and its Performance Compared with a Similar Brick-lined Cupola*

By W. Y. Buchanan

MR. BUCHANAN is metallurgist and foundry manager to John Lang & Sons, Limited, Johnstone, near Glasgow, a position he has held since 1933. His earlier activities included routine and research technical work on heavy steel production and the founding of cast iron and non-ferrous metals. A number of papers on most aspects of foundry technique have been contributed regularly since 1930. He has been active in the work of the Institute and BCIRA committees, and has held membership in the American Foundrymen's Society and other learned societies.

It appears to the Author that water cooling of cupola linings could quite well become general practice. So far, there seems to have been a number of individual trials in Scotland and, with this in mind, notes on one such effort should prove useful to other foundrymen. Where water-cooled spark-arresters are in use or contemplated, the same water system can be adapted and modified to serve the lining cooling system as well and an example of this is given. The Balanced-Blast cupola, because of its unusual tuyere system, requires a different approach and this Paper gives a comparison between two 45-in. bore Balanced-Blast cupolas which are identical in all main dimensions, melting the same charges, for the same castings, using the same raw materials, etc., for castings subject to the same degree of unreasonable inspection standards, and operated by the same cupola men. From data collected, an attempt has been made to compare the performances. Air-weight control, warm blast, air heating by oil and oil injection at the melting zone are also deal with.

The idea of applying water cooling to the lining of the 45-in. dia. Balanced-Blast cupola required considerable thought as the proposition was by no means simple. The idea of making a drawing to show the spacing of the 56 2-in. pipes, uniformly interspersed between 8 large tuyeres and 16 small auxiliary tuyeres, then setting these in to connect mechanically to a single circular main was too much for a part-time amateur. For the same reason, panels or hollow segments were ruled out and the wind belt had to be raised.

The 32-in. Balanced-Blast cupola never had been a convenient size for producing large castings, so it was decided to build a new 45-in. dia. cupola to replace this unit. As described in a previous paper† the first 45-in. Balanced-Blast cupola was erected in two days by pulling it into position in two pieces which were relatively light—the heaviest section being about 5 tons. This method was no longer feasible because of serious restriction of space; indeed careful attention had to be paid to measurement on the site. There was also not the same urgency. It was decided, therefore, to make the cupola shell in six sections, bolted together through carefully matched angle-iron flanges, with plate rings in between.

This actually produced a very strong structure, well able to withstand any additional weight of future additions, all plans being distinctly of the long-term variety. It soon became obvious that the erection of the mechanical details in the foundry under a suitable crane would present no insurmountable difficulty. The attitude taken was that no detailed drawings were needed and ideas were developed "on the job." If apprehensions were expressed as to the success of the project, the reply was, "Never mind, if it does not work as a cupola we can always make something else out of it." (There seemed to be so many pipes in the job that eventually it was suggested Reginald Dixon, the organist, might be able to play it).

The question was not whether the cupola could be made with its sets of pipes, cooling segments, spark arrester, etc., but whether it could be pulled into place in such a confined space as it would obviously be scraping against obstacles on its way up. Since the erection of the first 45-in. Balanced-Blast cupola, the platform had been altered and the headroom was now less than the diameter of the cupola. This ruled out the usual approach, *i.e.*, putting in the lower sections and lifting others on top. An improvized derrick was made by screwing together two lengths of 4-in. dia. pipe, setting one end in a socket fixed on the platform and using an almost vertical angle on the derrick to lift up the girders to form the "goal posts."

The safe working load of girders, wires, etc., and the pull on the winch were all calculated beforehand, particular attention being given to safety, as the workmen were all new to this type of work.

ERECTION

Fig. 1 shows how the foundation was set in, with four posts of 4-in. mild steel located, secured, and

* Paper originally given to the Scottish branch of the Institute of British Foundrymen and subsequently in Manchester, Falkirk and Newcastle-upon-Tyne. It has been somewhat abridged for publication, the original containing over 80 illustrations.

† FOUNDRY TRADE JOURNAL, January 16, 1936.

cast in. The cupola legs were set over these and the bottom plate bolted in place; four brick piers 9- by 9-in. were built in the spaces between the legs to prevent the plate sagging under the concentrated loads to be rolled into place. A heavy anchor was cast in the concrete base so that with a rope block located here, a direct vertical pull could be exerted on the top lifting girder, for present and future use. Heavy wooden blocks were securely bolted and dogged together, and a set of three 90-lb. rails, bolted together with about 18 in. between them, were set in place, on which to slide the loads on rollers of 2-in. bar. This small size of roller was necessary because of the low headroom.

In Fig. 2 are shown the sequence of lifts adopted, it will be noted that the usual procedure was reversed. The upper sections were lifted and suspended in turn so that the wire to the winch could be threaded through each successive section to permit a direct lift. The wires of the lifting tackle were clamped to hold up sections 1 and 2. Numbers 1, 2, and 3 were suspended on two beams and No. 4 hung on long bolts under the beams while sections 5 and 6 were rolled into place (these sections were numbered from the top downwards). The entire method of construction and erection was worked out before ordering any of the materials and the job went up substantially as planned.

When the cupola base was securely bolted, the brick butts were knocked out and heavy plates were riveted into place to stiffen the base-plate. The lifting tackle was then used to raise the cast-iron segments and these were bolted in position. The

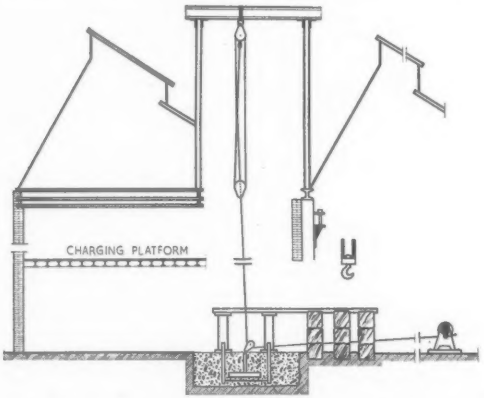


FIG. 1.—*Arrangement of lifting gear collected on site for erecting and assembling the new 45-in. Balanced-Blast cupola.*

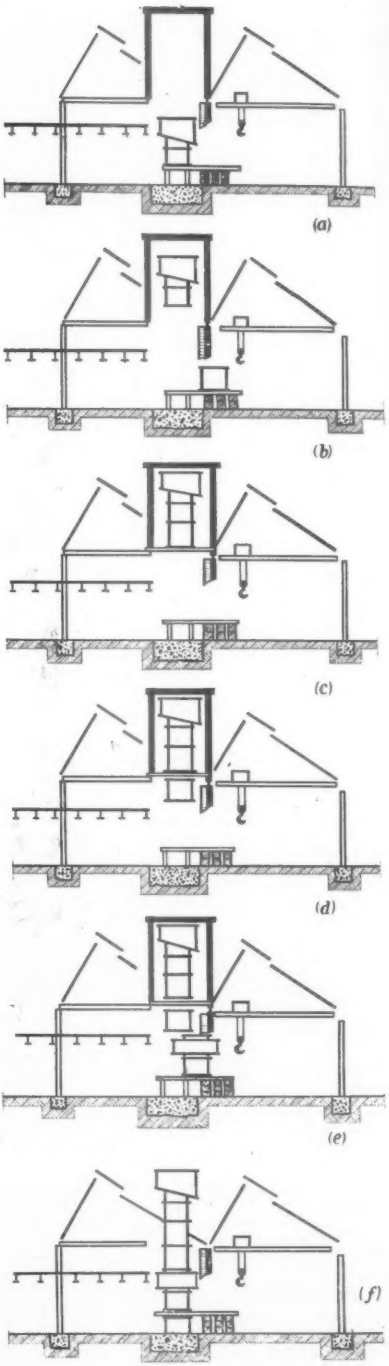


FIG. 2 (RIGHT).—*Stages during the erection of the cupola, indicating the sequence followed.*

shell sections were all bought-in plain, and all drilling, cutting, and fitting was done in the foundry. After erection, the charging door and other openings were put in position and heavily reinforced by riveted straps, angles, *etc.*, heavy brackets being fitted to the base. The continuous runner was built on, and the platform altered to suit bucket-charging.

Handicaps

The erection of this cupola caused a few anxious moments, for example, the top section proved to be about ½ in. bigger than the space between the roof tresses through which it was supposed to pass, and at one point an 8-ft. cone for the dust catcher hung like a flying saucer and menaced the erectors from a height of 40 ft. The job was planned to occupy July or August in order to avoid wet stormy weather, but because of various delays,

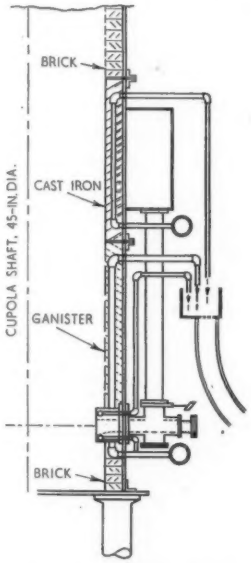


FIG. 3.—*Part section through the cupola showing the method of connecting-up the cooling system.*

the entire job was carried out in wind and rain. As the roof was open and no gutters existed on what was left of it, the workmen had to look upwards through a steady downward stream of dirty cold water, the other furnace being in use at the same time to harass the erectors with sparks and gas. On the other hand, the alignment of the fan, which rested on a platform through a wall, was found to be within ½ in. of that desired. In the end, the erectors were well pleased with what was quite an achievement for them, particularly since it was prophesied that the job would never go up at all.

Cooling System

The cooling system shown in Fig. 3 is really composed of three separate sections.

FIG. 4.—*Cast cooling panel for the upper section with pipes projecting.*

Section (1): *Melting Zone*

Vertical pipes were used here as these are less severe than panels in their cooling action. Standard pipe-fittings were used, so as to make replacement easier and quicker. The object was to keep the lining as hot as possible short of fusion. The only fear was of damage occurring to the system during charging but, by careful hand charging of the first two charges, the pipes were well covered.

Section (2): *Charging Zone*

Vertical, water-cooled, cast-iron sections were used here because they could not affect the melting zone and would withstand the heavy abrasion resulting from charging.

FIG. 5.—*View of the vertical 2-in. dia. cooling pipes and tuyeres assembled in a section of the cupola shell.*

Cupola Performance

Section (3): *Tuyere Zone*

Water-cooling of tuyeres was adopted, for quite a number of reasons, *e.g.*, the future application of oil. (It is of interest to note here that these castings

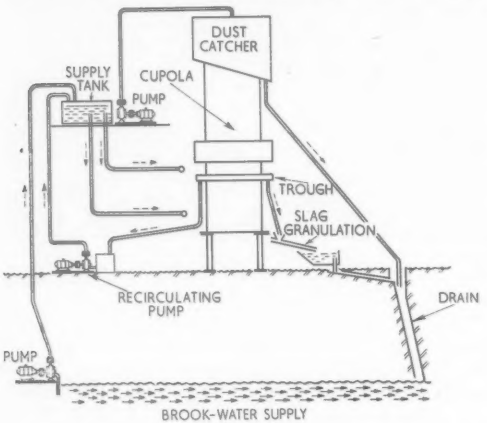


FIG. 6.—*Diagram of the water pumping system and the pumping arrangements.*

are still as sharp on their inside edges after one year's use as when they came from the dressing shop.)

Tuyeres

The tuyeres were water cooled by casting a ring in the nose of the tuyere together with inlet and outlet pipes. (Owing to the heavy section required to accommodate the cooling pipe, such castings are not easy to make—there is the possibility of melting the pipes if the mould takes too long to fill. Compressed air can be blown through the pipes during casting but this must be done carefully or condensation on the pipes may cause considerable disturbance in the mould.) When built in position, the tuyeres projected 3 in. beyond the lining but this was not found to be a good arrangement, as it exposed more cooling area to the descending metal. The projecting tuyeres held up slag during the drop and also increased the amount of bed coke necessary. Subsequently, it was decided to patch the lining in the cupola well out to the edge of the tuyeres, and this gave improved operation and less material to chip down.

Upper Section

In order to reduce wear of the brickwork in the upper section of the cupola—due to the abrasion of heavy pieces of scrap which may in certain conditions strike the brickwork opposite the charging door—it was decided to use heavy cast-iron segments here. These were made by casting a nest of pipes connected in series, *i.e.*, in at the bottom and looped up and down twice and out at the top (Fig. 4). These pipes were first screwed up, welded at the joints, then set in a sand mould and three evenly-spaced, cast-iron bars were cast on them. This assembly was next set in the mould and the complete panel cast. This method was chosen to prevent the pipes softening and floating during casting. In this system, there is a positive direction of water flow and no possibility of water going up one side only. However, with a gravity-feed system at low pressure, an air lock can occur at the top of the loops, but this corrects itself when the stationary water becomes overheated.

Lower Section

From the tuyere level to about 6 in. above the normal bed level, 1½-in. dia. steel tubes were set vertically in the lining at about 4 in. between centres so that a 6-in. ganister lining would cover the pipes to a minimum thickness of ½ in. (Fig. 5). This system is favoured because of its successful application to a cupola used for melting borings. With it, it is thought that the cooling action is less severe than with continuous panels; the object being rather to maintain the surface of the cupola wall at as high a temperature as possible short of actual fusion and solution into the oxide slags. This is also the most convenient system in which to instal auxiliary tuyeres.

Pumping System

Fig. 6 is a diagram showing the pipe arrangements. Water is pumped from a stream to a supply

FIG. 7.—*Front view of the cupola with tapping in progress.*

tank on the cupola-charging stage. From this, two separate circular mains are supplied by gravity, the lower one supplies 56 cooling pipes and eight tuyere nozzles and the upper supplies the twelve cast-iron panels. All the water from these two systems feeds into a circular trough and is returned to the supply tank, except that sufficient water is taken off to flush the slag disposal system. Another pump delivers water from the supply tank to the dust catcher, all this later goes direct to waste, as does that coming from the slag box. The latter is mounted on rails and is cleared away before preparations are made to drop the cupola bottom. Slag is disposed of by crane only. Figs. 7 and 8 show front and rear views of the cupola, respectively.

Temperature

General

In judging the effect of water cooling, temperature is obviously the most important consideration. The mere opinions of observers are no use, particularly if the observers see a cupola only now and then. For this reason, the Author has often objected to loose and inaccurate statements on temperature. For the purposes of this record, all temperatures were taken using the same optical pyrometer and always by the same man. If, however, the temperatures are recorded over periods of as long as 25 years, the personnel cannot be guaranteed not to change. However, in the figures quoted each group is taken by the same man, all readings given are as read, no correction being applied, but a graph available in BCIRA literature shows the magnitude of correction usually to be applied; for example at 1,400 deg. observed temperature, 120 deg. has to be added. Since the observations to be quoted were all taken under the same conditions, direct comparison between day-to-day or before-and-after major changes is quite sufficient to gauge the effect. Temperature readings were taken daily throughout the heat at intervals of five minutes. It is usually rather unsatisfactory to take readings on one or two casts only, because of the variables such as heavy pieces in the charge, temperature and humidity of the air, barometric pressure, coke quality and size, difficulty in lighting up properly, length of blow, *etc.* In plotting the graphs to be shown later, a great many points coincided, so these were set side by side in checker pattern. This allowed the points to be accommodated within the accuracy of the observations in the scale used.

Records

Fig. 14 shows the metal temperatures recorded for the No. 2 Balanced-Blast, brick-lined furnace, for the first 80 days of operation of this furnace in the first quarter of 1935. These temperatures were regularly taken as a routine control and recorded with other data. At this period, it could be said that this furnace was giving excellent results and its performance compared very favourably with any other furnace for which operating details could be obtained. It was operating on 1.43 cwt. coke charge, 2.75 cwt. total coke per ton, using 3-in.

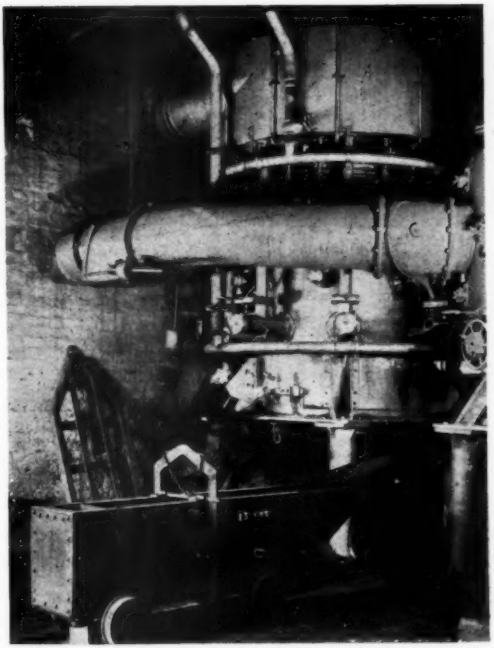


FIG. 8.—*Rear view of the cupola, note the slag-disposal bogies in the foreground.*

coke nuts. The number of readings used to make this graph was 1,308 and it is obvious that any more would have overcrowded the illustration. The graph shows the furnace reaching its best range of temperature, 1,420 deg., in about 20 min. from blast on, with a maximum reached at about 35 min. and then falling off. The average temperature for each day was worked out and the mean of all these averages gives 1,389 deg. C. The scatter of the points indicates the magnitude of the variables encountered in day-to-day operation, even with the best possible attention to lighting up times, burning-in of the bed, careful hand charging, regular operation of the tuyere shutters, *etc.* This sort of evidence leads the Author to avoid the use of strictly mathematical methods when dealing with the subject of cupola theory and practice.

A record was made of the temperature during the period January to March 1950, when the furnace was operated badly. At the time, hand charging was still in use but the furnace was going so badly that re-organization become necessary. The temperature graph containing 415 points showed temperatures in a very low range, with a falling off after about 50 minutes' operation. The average of daily averages of temperature was 1,327 deg., which compared very unfavourably with that shown in Fig. 14—1,382 deg. C. The scatter of values is very bad, showing much irregularity in working. The excessive wear and tear on the furnace, a

number of breakouts, and the like, made this period a black one from the point of view of operating efficiency.

Oxygen Enrichment

When operation commenced with the water-cooled furnace, a certain amount of trouble was

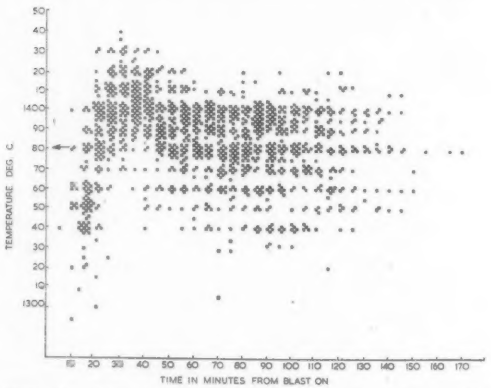


FIG. 9.—*Graph of temperatures taken from the records of the No. 2 Balanced-Blast brick-lined cupola immediately after commencement of operations.*

expected during the early stages but this difficult stage persisted too long. The rate of melting was low and the temperature and fluidity of the metal at times was at a minimum. The employment of oxygen here was, therefore, not a metallurgical refinement but a dire necessity. If it had not worked, the furnace would have been closed down, and quickly too. There was no literature on the subject to consult, so oxygen from cylinders was blown into the blast main, *with* the fan running, of course. In the first trial, oxygen was introduced after the first ton of metal had been taken away. Cylinders of the gas were used up one after another over a period of 20 min. in all, sufficient being added to raise the percentage of oxygen in the air by 0.8 per cent. The expected metal temperature rise took about 20 min. to show itself at the spout. The results of the oxygen addition were very obvious; metal fluidity, "life," and temperature were much improved (though no temperature readings were taken) and the melting rate was up.

As a result of the first experiment, the oxygen addition was scheduled to start at blast-on. The objective being to brighten up the bed and increase the rate of absorption of cold air. In general, oxygen application would appear to be most beneficial where it was most urgently required. However, extended experiments have so far not been carried out as is was obviously undesirable at the time to run oxygen enrichment on alternative days to produce, possibly, sets of good and bad results in a production cupola; that would have been carrying science too far. If experiments are carried on elsewhere, there should be no difficulty with equipment, as there is nothing to go wrong. It is true that at the pressure existing in the cylinders,

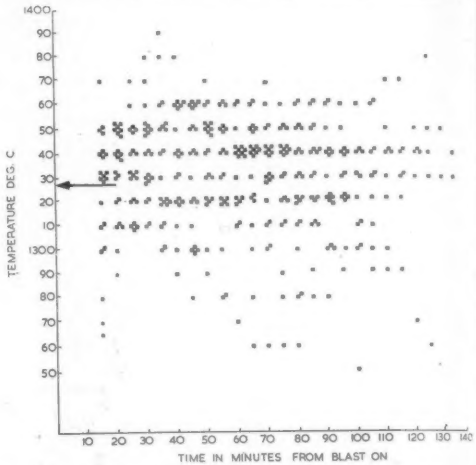


FIG. 10.—*Temperature records for the same cupola as* FIG. 9 *during a period of inefficient operation.*

oxygen can be dangerous, but the oxygen can be allowed to escape as fast as required by means of simple pipe connections.

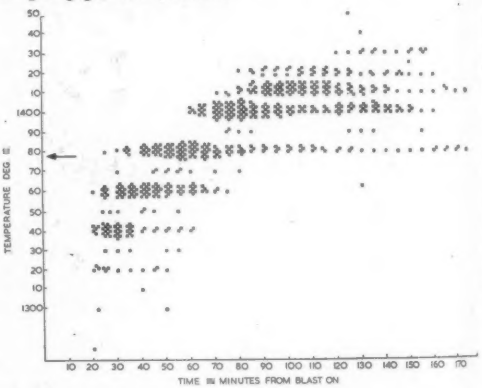


FIG. 11.—*Graph of metal temperatures resulting from melting in the water-cooled furnace, using oxygen enrichment of the blast.*

WATER-COOLED CUPOLA

No temperature records are available for the first runs of the water-cooled furnace. Those represented in the graph, Fig. 11, were taken after the establishment of the routine procedure of which oxygen

enrichment became an essential part at the time. The graph is based on 657 points, sufficient to establish the general shape of the curve—note the lag at the beginning which indicates colder metal at the start.

After careful consideration of the results, it appears that the cooling water, which must run during the lighting-up period, prevents the storage

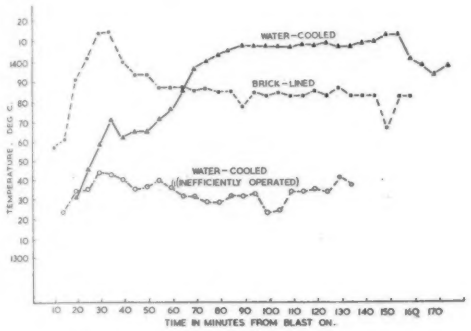


FIG. 12.—*Metal temperatures from the water-cooled and brick-lined furnaces compared.*

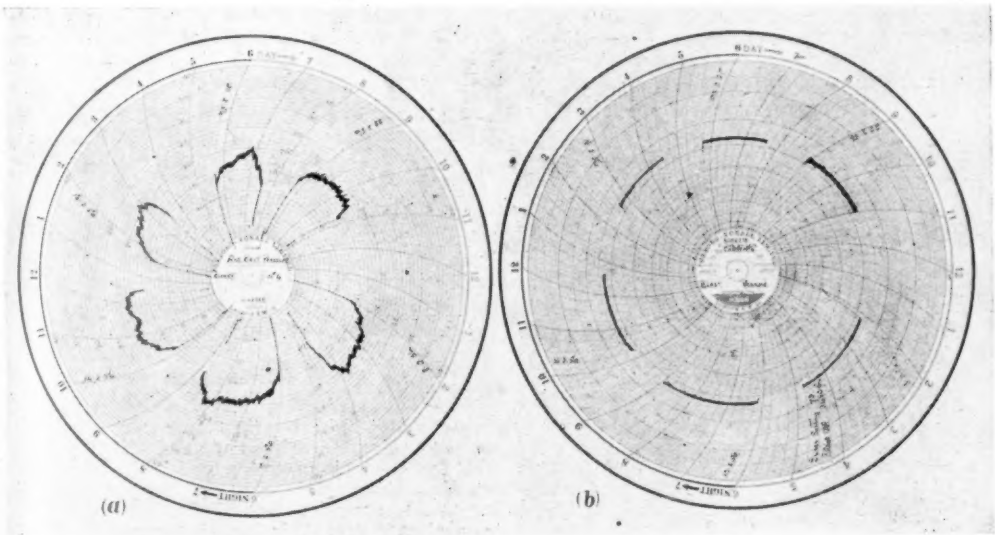
of heat in the bed and lining and, since this stage of combustion depends on natural draught, the application of cooling water is a disadvantage. The situation appears analogous with a cold car engine which won't accelerate till it heats up, the bed is not in as good a condition to take the full blast of air from the fan at the beginning. However, the water cooling does not appear to cause low-temperature metal during the subsequent part of the heat, and it would therefore be less troublesome on long runs.

For comparison, it should be noted that the continuous runner could not be left open when starting up, in order to run off say 10 cwt. This amount had to be retained in the well and the first metal coming over had to heat up the continuous runner. The temperature during the first hour was nevertheless low and would require to be improved, particularly if short runs and small tonnages were being melted. It should also be added, too, that the coke ratio—by comparison with the early runs of the brick-lined cupola—was nearly doubled, but further adjustments were soon planned. The scatter of points in the graph Fig. 11 is considerably less than in Fig. 10, indicating better regularity of melting, and the mean of daily averages of metal temperatures gives 1,379 deg. C., in spite of the low-temperature metal during the first hour.

Temperature Comparisons

To further clarify the previous remark, the averages of all temperatures at each interval of five minutes was calculated and plotted as shown in Fig. 12. It will be seen that whereas the graph for the brick-lined cupola shows maximum temperature was reached after 40 min., the water-cooled furnace took nearly 80 minutes to achieve this even when oxygen enrichment was practised. The brick-lined furnace temperature showed a

FIG. 13.—*Records of cupola blast for the water-cooled furnace on six consecutive days (a) pressure when not operating the air-weight controller and (b) volume when this apparatus was in use.*



Cupola Performance

tendency to fall off after reaching the maximum and this appeared to have some relation to slag formation obstructing either the flow of gas or combustion of the coke, and also perhaps to what some would

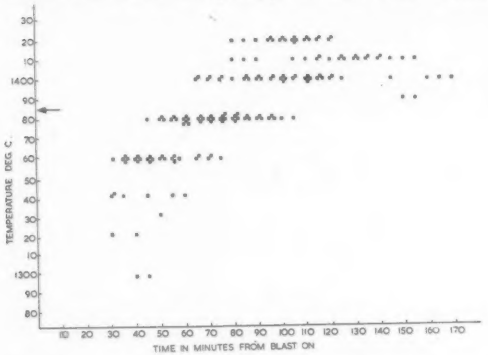


FIG. 14.—*Graph of metal temperatures produced in trials soon after the application of the air-weight controller to the Balanced-Blast cupola.*

call the ill-advised practice of trying to economise in coke in the second half of the blow by using heavier metal charges. This latter practice is still carried on in the water-cooled cupola but not with the same degree of enthusiasm. Depreciation in quality of coke is a factor which also must be kept in mind. The effect of inefficient furnace operation of the type shown in Fig. 10, is shown in the third record of the illustration.

Air-weight Controller

An automatic air-weight controller was installed on the water-cooled cupola plant and set in operation. In the writer's opinion, such an installation can

FIG. 15.—*Air-heater casting, showing the fins cast-on to improve heat transfer.*

always be justified, there is no question of its value, the only difficulty in some cases might be getting an official decision to sanction the first cost. In cupola blowing, the variation in resistance to the flow of gases is considerable and erratic and, as is well known with the usual type of fan, the volume delivered varies in the reverse direction. This considerable change in volume delivered is also reflected in the electrical power used by the motor. Examples of cupola-blast pressure records on six consecutive days are shown in Fig. 13(a), while Fig. 13(b) shows the blast volume controlled by the new apparatus almost to a single line in each case. Since this equipment corrects for atmospheric temperature and pressure, the delivery is actually a constant weight of air and thus of oxygen.

This control must have an enormous effect on the uniformity of performance of a cupola. It should be remembered that some 16 tons of air per hour is used, and the control of this quantity to prevent excessive up-and-down variation is important. The controller reacts to the slightest change *e.g.* if a tuyere shutter is closed, the pressure graph jumps up and the volume drops 250 cub. ft. per min., then the control mechanism begins moving the pen back on to the line. With a little care, the

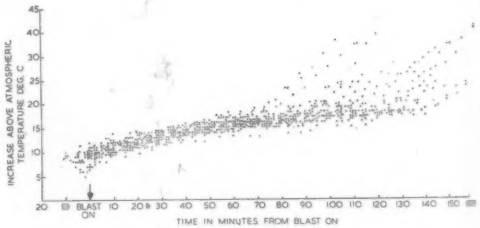


FIG. 16.—*Temperature increments for cupola blast obtained with the blast heater operating (after deducting the outside atmospheric temperature).*

actual air delivered by each tuyere can be measured, thus checking both the setting of each individual tuyere and uniformity of distribution around the furnace. Having thus demonstrated the increase of pressure due to closing a tuyere, and bearing in mind that there is not the same need to clear the tuyeres in a water-cooled cupola, the established Balanced-Blast practice—namely closing the tuyeres one at a time every 5 min.—was discontinued on the water-cooled cupola, although it was still used and found very beneficial with the brick-lined cupola.

Effect of Controller

The introduction of the air-weight controller demonstrated (Fig. 14) right away that too much air was being blown in, and it was certain, also, that too much air was being used in the brick-lined cupola. The graph is based on 158 points only but appears to show less scatter of points (40 deg. C. as against 50 deg. C.) in Fig. 11, the reduced scatter

being most noticeable at the end of the blow when uncontrolled air normally becomes excessive. The mean of daily averages at 1,386 deg. C. is an improvement on that recorded in Fig. 11.

Warm Blast

The success of a very simple and robust air heater, in a furnace specially designed for melting loose borings, led to its adoption for the 45-in.water-cooled, Balanced-Blast cupola. This consisted of directing the air-blast through a cast-iron pipe passing through the furnace just above the charging door. A perusal of early literature on the subject of blast heating gives particulars of a great variety of cast and iron and steel recuperators, many of them set in the stack to utilize heat from the flame usually present during cupola working. That these all seem to have disappeared from common practice was perhaps due to the effort to get too high a temperature, resulting in the destruction of the heating chamber. Also, the difficulty of frequent replacement of these heaters was no doubt rather discouraging. At the same time, it should be borne in mind that they were introduced at a time when raw-material resources were not conserved at all and good instrumentation of furnaces was non-existent.

and so the cupola, when blown by a fan, gets more oxygen by weight in winter than in summer. However, when equipment is installed to correct for both these variables the true effect of temperature is more pronounced. Thus with a constant increase in blast temperature as obtained in built-in air-heater of the type described, the maximum temperature of air delivered to the furnace will rise by the normal seasonal increase in atmospheric temperature. This point might be worth following up but would require the collection of data.

Fig. 16 shows the actual increase in air temperature after passing through the heater. As would be expected, the temperature rises as the blow proceeds. It is also seen that when blowing down, the temperature reaches about 30 deg. C. Unfortunately, like all these arrangements where the furnace heats its own air, there is the inevitable time-lag at the beginning of a melt. Experiments have been made using an auxiliary oil burner to raise this temperature at the start, but no detailed information has been collected up to the time of writing.

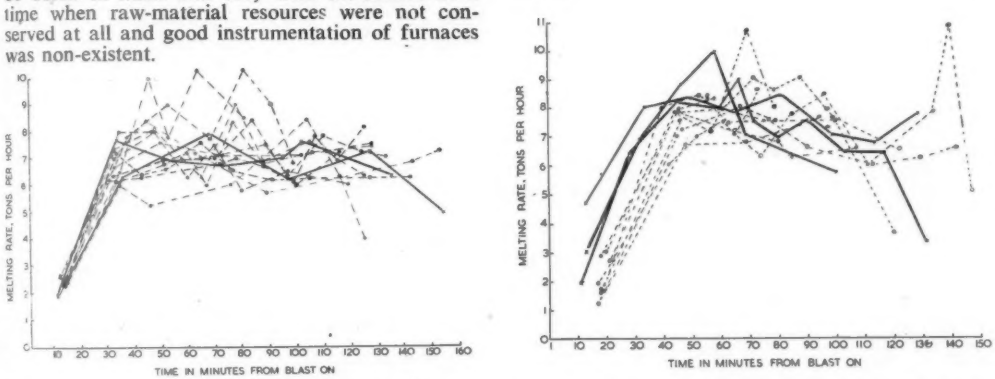


FIG. 17.—*Melting rates calculated from weights of consecutive ladles throughout runs with both furnaces (brick-lined—solid lines, and water-cooled—broken lines), (a) before and (b) after installation of the air-weight controller.*

The cross-sectional area of the heater (Fig. 15) used, is intentionally kept low relative to that of the blast main, so that the velocity of the air in this heater is sufficient to prevent it from becoming red hot, at which temperature ordinary cast iron and steel deteriorate rapidly. Such temperature readings as are available, indicate a useful increase in metal temperature, but the Author is unable at the time of writing to present the thousands of temperature readings which would be necessary fully to support the statement. Indeed, the improved performance of the water-cooled furnace over the brick-lined one could be seen more easily by the man on the floor than can be set down conclusively on paper.

Heated Blast in a Water-cooled Cupola

It has always been understood that during cold weather, air is both heavier and lower in humidity

Rate of Melting

It is customary to state the average rate of melting of a cupola from time of blast-on to blast-off, against the total metal charged to the furnace. Such a figure includes the starting-up time and does not take into account the unmelted material in the drop. In short runs, the variation of the drop weight and the initial condition of the bed before blast-on have an important effect on this average figure. To get more detailed information on melting rate, a crane weighing machine was bought, and successive ladles of metal were timed and weighed regularly. Fig. 17 (a) shows a comparison between rates of melting for alternate runs of the brick-lined (solid lines) and water-cooled furnace after the oxygen addition was in operation (broken lines).

From this somewhat inconclusive evidence the first runs of the water-cooled furnace showed some

Cupola Performance

low melting rates balanced against subsequent higher rates. In general, nowadays, the rate of the water-cooled furnace is as good as the brick-lined cupola, in spite of the fact that average overall rate of the runs of the water-cooled funace was 5.65 tons per hr. and, with oxygen, 6.35 tons per hr. as compared with 6.51 tons per hr. for the brick-lined furnace. Fig. 17 (b) shows melting rates through alternate runs on each furnace, after the installation of the air-weight controller. In general, the melting rate in the water-cooled cupola was maintained while using much less blast, although the average overall rate is shown to have dropped below six tons. There was also a tendency to dropping off of the melting rate in the

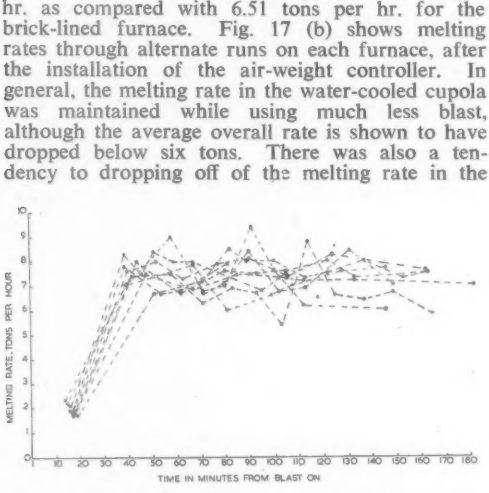


FIG. 18.—*Melting rates for consecutive casts after the installation of the air-heater to the Balanced-Blast cupola.*

latter half of the runs in both cupolas. The excessive blast commonly encountered while a cupola with uncontrolled air delivery is blowing-down is associated with poor metal quality, but is evidently not accompanied by a correspondingly high melting rate.

Fig. 18 shows the influence of warm blast on the melting rate of the water-cooled cupola. There is evidently less tendency for the melting rate to fall off towards the end of the run. Fig. 19 gives the average daily melting rate from blast-on to blast-off for the same cupola. It can be seen that the cupola started off very badly, being considerably improved with the use of oxygen to boost combustion at the beginning. The air-weight controller was finally set to deliver 3,650 cub. ft. per min., which was evidently much less than had been previously used in this furnace. This reduction in blast volume is shown to have reduced the average melting rate, at least during the short interval available for comparison—roughly one month.

Consumption of Patching Material

As a basis for comparison of the consumption of patching material for the two cupolas, the statistics for the first 13 years of the life of the brick-lined cupola, *i.e.*, 1935 to 1948, were used, each point on the graph, Fig. 20, being the average daily consumption over a month and the graph is thus based on 2,700 daily weights. It will be seen that the consumption was low in the early years, when good control could be exercised over furnace labour. From this, a mean figure of 11 cwt. per day would perhaps be fair and reasonable. Following 1948, as indicated in a previous paper*, the quality of furnace labour deteriorated and the consumption of refractories was quite unreasonably high.

The water-cooled cupola now uses about 3 cwt. fireclay or ganister (Fig. 21), and the time required to complete the lining preparation is proportionately

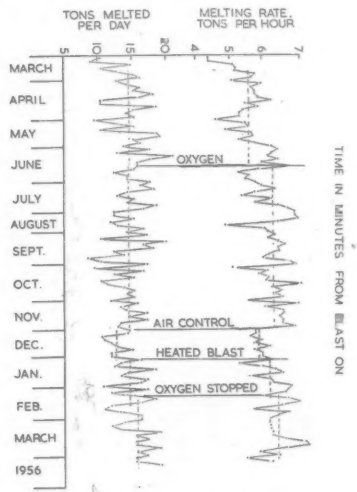


FIG. 19.—*Overall melting rates and tonnage melted during each consecutive stage in the development of the water-cooled cupola*

much lower. It should however be mentioned that in recent runs of the brick-lined cupola with good furnace control, the weight of patching material for this furnace has dropped nearly as low as that needed in the water-cooled cupola, again emphasizing the important effect of strict control on the performance of any cupola. When small layers of patching are used, it is worthwhile using first-quality fireclay. Due to the fact that ganister is bought wet and perhaps sent a long distance by rail, it may quite easily, because of its high refractories, turn out cheaper to replace wet ganister by first-quality fireclay, which is bought as a dry powder in bags.

Metal Fluidity

The test procedure used for measuring metal fluidity at the Author's foundry is the same as used for work referred to in a previous paper†, the Saeger & Krynitsky test procedure being used. Corrections for the effect of temperature, silicon,

* *Proc.* Inst. Brit. Foundrymen. 47, A56.

† FOUNDRY TRADE JOURNAL, February 15, 1940, "Fluidity and the Balanced-Blast Cupola."

carbon, phosphorus and sulphur contents are given, so that variation of these elements can be allowed for when assessing the effect of one variable in presence of others under everyday conditions.

SUMMARY

Table I gives in condensed form a summary of the impressions formed in each stage of the development of the cupola up to the present routine practice. Two main mixtures are run daily, a low-silicon metal of the 1.3 to 1.5 per cent. range and a general-purposes range of about 2 per cent. silicon. The attempts at improvement were concentrated mainly on the low-silicon mixture which came first. Commenting on Table I:—

Column 5. With addition of the air-weight controller, the blast volume was considerably reduced, giving improved fluidity with lower-phosphorus, increased carbon and increased temperature and much greater uniformity in quality of metal throughout the blow.

Column 6. With the addition of warm air at low temperature, a further improvement in metal fluidity was obtained, with lower phosphorus, increased carbon and increased temperature.

All these above improvements tend, of course, toward economy in ferry-alloys and bought-in low-phosphorus pig-iron. Opinions may vary on the cause, effect and interpretation of the observations and collected figures recorded, only a small fraction of which have been reproduced in the Paper, but there is no doubt that the water-cooled, Balanced-Blast cupola described is now giving excellent results.

TABLE I.—*Trends of Results Obtained with the Balanced-Blast Cupola according to Modifications Applied.*

Metal.		Brick-lined furnace.	Water-cooled furnace.	Water-cooled furnace (with oxygen).	Water-cooled furnace (with oxygen) (warm-blast pig-iron used in low-silicon mixture).	Water-cooled furnace (with oxygen and air-weight controller).	Water-cooled furnace (with oxygen and air-weight control and warm-air blast).
Low-silicon mixture	Fluidity (in.)	30	19.9	19.8	21	21.3	23
	Phosphorus, per cent...	0.347	0.458	0.393	0.359	0.345	0.312
	Total carbon, per cent.	3.16	3.23	3.15	3.26	3.29	3.327
High-silicon mixture ..	Fluidity (in.)	30	20	28	26	24.2	26
	Phosphorus, per cent...	0.36	0.596	0.570	0.438	0.414	0.40
	Total carbon, per cent.	3.18	3.17	3.03	3.16	3.22	3.27
Temperature (as read), deg. C.	Mean of daily average	1,320 1,380		1,378	1,382	1,386	1,389
	(maximum)	1,370 1,420		1,430	1,410	1,420	1,440

Column 1. For the brick-lined, 45-in. dia. furnace showed temperatures during contemporary runs of 1,320 and 1,370 deg. C., and during the best period (1935) of 1,380 and 1,420 deg. C.

Column 2. With the new, water-cooled 45-in. furnace, the first period showed a drop in fluidity, metal temperature very low, and a great deal of trouble in casting even with the phosphorus content raised to attain the fluidity stated.

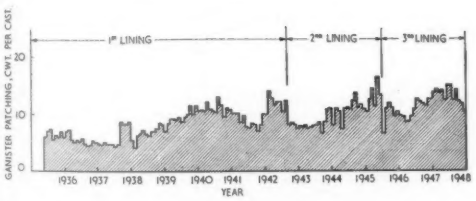


FIG. 20.—*Consumption of patching material in the brick-lined cupola.*

Column 3. After the addition of oxygen to the blast, the fluidity was maintained with a lower-phosphorus content, the temperature was very much improved and excessive blast was employed to step up the output.

Column 4. Here, part of the low-silicon mixture consisted of remelted pig-iron made in the borings' furnace, using warm blast, and the table shows its effect in increasing the carbon, giving higher fluidity even with lower phosphorus.

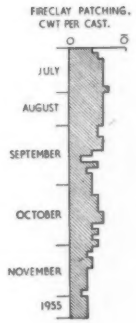


FIG. 21.—*Consumption of patching material in the water-cooled cupola.*

OTHER EXPERIMENTS

Slags

Several times the study of slags was taken up and series of slag samples collected, using varying limestone additions of both small and large particle-size to the brick-lined cupola. Various efforts were also made to reduce or alter the quantity of silica sand going into the charges, at times producing

Cupola Performance

very light-coloured slags under special conditions. The limestone percentage was raised as high as 35 with a metal sulphur content of 0.466 per cent., using 132 lb. limestone per ton of metal charged. However, the results were somewhat erratic, perhaps due to lack of uniformity in the slag itself even when taking an average of four samples.

A programme of work was also carried out on the furnace used for melting cast-iron borings, but here, the more limestone added the more silica came off the lining and the slags did not change much in composition. Water cooling makes this line of investigation more promising and it is believed that preliminary cleaning of the metal to be charged is a good line to follow up. Four pounds of soda ash per ton of metal is greatly favoured, as keeping the slag very fluid and easier to separate from the metal.

Oil Fuel

Oil fuel has been tried out in the small borings' furnace and there is no practical difficulty in its application. It has been used to boost combustion and replace some coke but the experiments were only intended to try out the idea, and data have so far not been collected systematically. Experiments are planned for introducing oil fuel in the water-cooled, Balanced-Blast cupola and preliminary trials have been carried out here, too. Oil has also been installed for increasing the effectiveness of the air heater at the beginning of the day's run.

Coke Recovery

The cupola "drop" resulting at the end of each melt is now handled by a continuous washing plant and the recovered material, coke and metal, is used in the borings' furnace as a matter of routine, thus reducing considerably the usable material previously carted to the dump.

French Foundry Association

Extracts from the Annual Report

This annual report of the *Centre Technique des Industries de la Fonderie* (issued from the Paris headquarters) takes the form of a 64-page mimeographed book and except for finance, covers very adequately the *Centre's* very diversified activities. The staff has varied but little since 1952 and numbers 308, of whom 13.3 per cent. are not on the scientific and technical staff. There are nine regional laboratories to be staffed, in addition to the headquarters in Paris and Sèvres. The number of complete analyses carried out during the year was of the order of 81,700—a figure lower than the previous two years, when some work of dubious interest was undertaken. A library is maintained carrying 2,076 books and 11,000 other documents. Moreover, between 5,000 and 6,000 magazines, books, catalogues and the like were received during the year and a very large number of foreign ones were translated.

Much work is done in the issue of quality marks—or *labels* as the French designate them. These have been established for blackings and core oils as raw materials; for domestic heating apparatus and aluminium pots and pans as foundry end-products, and actual castings in malleable, grey iron, light alloys, brass and bronze. The technical work of the *Centre* is under the supervision of ten committees.

Increasing effort has been and is being devoted to pure research during the last few years, and, during the year, work has been published on the treatment of cast iron by the bubbling of gas through it; on the examination of castings using radio-isotopes and statistical control; on hot blast cupolas; the influence of stray elements on the liability of thin castings to cracking; on the origin of brittleness after the galvanizing of black-heart malleable castings, plus about eight others dealing with different phases of foundry practice. The main activity of the *Centre*, however, is to help the individual foundry and this still accounts for 47 per cent. of the money spent, whilst fundamental and applied research is of the order of 26 per cent. The report makes very interesting reading.

PETTERS, LIMITED, of Staines (Middx), has appointed the Southampton Launch & Boat Company, Limited, as sales and service agents for the company's marine diesel engines.

Factory Inspectorate Expansion

The general shortage of qualified scientists and engineers is having repercussions in the Ministry of Labour's factory inspectorate. A White Paper announces that the Minister intends to appoint 26 more inspectors to improve the inspection of building sites and works of engineering construction, and the Engineering and Chemical branch of the Factory Inspectorate (now 18) is to be trebled and partly decentralized. The Minister also feels that a small increase in the general inspectorate appears to be necessary, but final decisions await the results of inquiries into the work load.

One "unbureaucratic" comment in the White Paper recommends that, because of the shortage of scientists and engineers, a Government department should not compete for them unless they can be shown to be essential—"all the more so where the work is such that the scientists and engineers do not make full use of their special skills."

Managements have displayed a growing spirit of co-operation which has tended to shift the emphasis from enforcement to advisory work, particularly in matters of safety, health, and welfare. It is this spirit which has led to the need for the reorganization and expansion of the inspectorate—needed much more nowadays to advise and commend than to condemn and enforce.

Demand for Steel in Europe

Experts of the High Authority of the European Coal and Steel Community have estimated that the demand for steel in Europe will increase by 30 per cent. in the next five years and by nearly 70 per cent in the next 10 years.

The present demand in the six nations of the community is 43,800,000 metric tons per annum, which will rise to 58,000,000 tons in 1960 and 73,000,000 tons in 1965. This last figure is a maximum and is extremely dubious should the present expansion of trade become less powerful. The mean rate of expansion of demand is thus 5.9 per cent. in the next five years and 5.3 per cent. in the following five years.

The demand is expected to increase most sharply in Italy, at the rate of 7.5 per cent. and least rapidly in the Netherlands, at 2.3 per cent.

The consumption of steel in Germany exceeded 21,500,000 tons in 1955 and is estimated at 29,000,000 tons in 1960 and 35,000,000 tons in 1965.

British Cast Iron Research Association

Annual Report for the year ending June 30, 1956

(ABRIDGED)

At the annual general meeting of the British Cast Iron Research Association, held in London on November 2, 1955, Mr. S. H. Russell was re-elected president, and the vice-presidents, Mr. C. C. Booth, J.P., M.I.MECH.E.; Dr. A. B. Everest, F.I.M. (president, Institute of British Foundrymen); Mr. S. W. Martin (vice-president, Joint Iron Council); Mr. A. E. Pearce; Mr. J. J. Sheehan, B.SC., A.R.C.SC.I., and Sir Harold West, were re-elected for a further year.

During the year, the Council, of which Mr. J. J. Sheehan was re-elected chairman, held six meetings, and its advisory committee ten meetings. Nineteen meetings were held by the main committees of the Council. (Research Board and Research Committee continued to have the services of Mr. A. E. Peace as chairman; the Development Committee those of Mr. J. J. Sheehan; the Information Committee those of Mr. R. L. Handley; the Foundry Atmospheres Committee those of Mr. C. Gresty. Following the death of Mr. Arthur Watson, reported last year, Mr. A. E. Pearce agreed to become chairman of the Operational Research Team Committee for a limited period, and Mr. R. Taylor succeeded Mr. J. Arnott as chairman of the Scottish Committee, and as member of Council.) The sub-committees and panels of the main committees of Council met on 16 occasions, making a total of 51 meetings in all during the year.

Income and Expenditure

The income and expenditure account for the year ended June 30, 1956 and the Balance Sheet as at June 30, 1956 accompanied the Report. Income at £197,372 is £6,011 greater than for the preceding year, most sources of income, including subscriptions, showing increases. Grant-earning income has again exceeded £120,000, thereby enabling the Association to earn the maximum Government grant of £56,000. The excess of income over expenditure for the year is £59,178 and of this amount £50,000 has been transferred to the buildings and equipment fund, and the balance of £9,178 added to the general fund.

It is very necessary to provide a new research block, and a building in which to carry out investigations on foundry atmospheres and dust control, which will involve the Association in capital expenditure of approximately a further £50,000. Following plans outlined in the last Report, active progress has been made on the equipment of the experimental melting station and on the plans for a new research block. The "open day" for members, scheduled for July, 1956, was postponed for a year in order that members should be able to see the lay-out and equipment of the experimental melting station.

The period of office of the visitors, Professor H. O'Neill of Swansea and Mr. W. Barr of Glasgow, appointed to the Association by the Department of Scientific and Industrial Research, having expired, the Department nominated as their successors Professor A. J. Murphy, principal of the College of Aeronautics, Cranfield (formerly Professor of Industrial Metallurgy at the University of Birmingham) and Mr. E. W. Colbeck, technical director of Hadfields, Limited, Sheffield. Their first visit took place in April, 1956, and the president, Mr. S. H. Russell, attended.

The director addressed six meetings of trade associations in the industry during the year, and meetings with several other associations have been or are now being arranged.

The director was invited to take the chair at the first meeting, in London in September, 1955, of the committee on cast iron of the International Standards Organization (ISO). Ten nations were represented by 30 delegates, with officers of the ISO and British Standards Institution. The meeting was regarded as highly successful and a considerable measure of unanimity was achieved.

Sand Courses

The sands courses, which have now been operated for some time, continue to be strikingly successful, and by the end of the current calendar year 40 such courses will have been held, attended by 470 representatives of member-firms. These courses last for four days and with these comparatively small groups of not more than twelve at one time, it is possible to combine talks by the staff of the Association with experimental work using the sand-testing equipment, so that those attending the course can combine active trial and experiment with personal contact with the staff. Nowhere else in the country, for this particular field of study, can be found this combination of experienced and specialized staff, and the special equipment which is available at headquarters.

The success of these courses, together with the keen interest displayed in the Association's conferences, notably those held on the CO_2 Process referred to elsewhere, suggests that the Association may have found a most satisfactory way of conveying to members the information at its disposal, a problem to which much attention is being given, and which has never been regarded as fully solved. Suggestions have been made for other courses, for example, on melting practice and furnace control, and also on analytical procedures. Such courses involve considerable problems of accommodation, equipment and staff, but the Council will encourage further developments as soon as practicable in any field where there would be advantage in this method of treatment, and suggestions from members would be welcomed. At the same time, it must be recognized that these courses entail considerable time and attention on the part of the staff concerned.

BCIRA—Annual Report

Research Department

Phosphorus in Foundry Irons

The panel, the formation of which was reported last year, has considered methods of utilizing British phosphoric iron-ore to provide the iron-founding industry with a relatively low-phosphorus pig-iron. A detailed examination has been made of all possibilities for the removal of phosphorus from iron-ore, pig-iron and cast-iron. Work in hand is concerned with the application of top-blowing and the possibility of eliminating phosphorus and yet retaining an appreciable amount of carbon in the melt. Encouraging results have been obtained from small-scale melts in the laboratory, and arrangements for large-scale work are in hand. In due course, it is expected that other experiments will be carried out, for instance, in conjunction with the basic cupola and the rotary slag-metal mixing furnace, and enquiries and preparations have been made for the installation of some of this equipment in the projected experimental melting station.

Soundness of Iron Castings

A detailed survey of drawing in light castings has been made in the foundry of a co-operating member. Field tests to investigate some details are complete, and the further data obtained are being assessed. An investigation is in progress into the anomalous sinking on the underneath face of light castings where there is a boss in the top section. A statistical interpretation of the defects found in K-bar test pieces obtained from a large number of crucible melts has been carried out. Experiments have been made to study unsoundness in nodular irons. The effect of casting size on soundness has been studied by means of K-bar test-pieces.

Mechanical Properties

The influence of understressing on fatigue properties has been studied and, contrary to indications in the literature, little effect was detected on pearlitic and flake-graphite cast irons of relatively high-tensile strength, and nodular cast irons. Further work is being carried out on low-tensile-strength cast irons to try to confirm the increases in endurance limit reported by other workers. Fatigue tests have been carried out on normalized nodular cast irons. This treatment, while improving the tensile strength, does not have a corresponding effect on the endurance limit.

Factors influencing the mechanical properties of pearlitic nodular cast iron have been studied, and it has been shown that the tensile strength decreases with increasing silicon content, due to a transition temperature phenomenon. Residual elements have also been shown to influence the mechanical properties of these irons. The tensile strength and elongation of pearlitic nodular cast irons have been shown to deteriorate in tests carried out in water.

The effect of variations in heat-treatment on the ferrite grain-size of pearlitic nodular cast irons has also been studied and the appropriate treatment for the production of a fine grain-size has been worked out. By refining the grain it is possible simultaneously to raise the ultimate and proof stress and to lower the impact transition temperature. A further programme of work on the temper-embrittlement of ferritic nodular irons has been completed. The influence of trace elements on the mechanical properties of nodular cast irons at elevated temperatures has also been studied.

The investigation of cast iron for use in steam engineering has begun, to see whether the relaxation of restrictions on the use of cast irons at temperatures above 205 to 230 deg. C. can be justified. A programme of growth test on 30 different materials has been planned and begun. When the materials have been sorted by long-term growth tests, creep tests will be carried out, the necessary equipment for which has been ordered.

Corrosion

The major project in this connection, in conjunction with the British Shipbuilding Research Association, is the prevention of pitting attack on cast-iron propellers by means of cathodic protection. The Association has developed a shrouded anode to fit to the propeller tail-shaft to minimize this attack. The extent to which the shroud reduces the current output has been studied. Many vessels have been fitted with magnesium anodes and their progress in service is under observation. A scheme for protecting a tug-boat propeller by means of a magnesium anode attached to the hull of the ship has been installed and has been under observation for several months.

The Association's interest in the cathodic protection of underground cast-iron pipes continues. The electrical continuity of such mains has been investigated and in some cases found inadequate. Experiments have been carried out to investigate the feasibility of improving the electrical conductivity of such mains.

Work has been started on the possible influence of anti-freeze solutions on the corrosion in the waterways of diesel engines. A special panel has been formed to supervise this work. Preliminary work has begun on an examination of used anti-freeze solutions. A laboratory apparatus has been constructed to study the decomposition of ethylene glycol and the depletion of corrosion inhibitors under conditions similar to those in the cooling passages of an engine. A method has been developed for the determination of glycolic acid in used anti-freeze solutions. Forty-three enquiries on corrosion problems from manufacturers and users of iron castings have been dealt with during the year.

Methods of Analysis

Methods of analysis are continually under review and the work involves considerable co-operative effort by works laboratories in the industry. The normal methods for analysis are being systematically examined for deficiencies, with a view to their incorporation in a handbook for analytical chemists, the first part of which is nearly complete. Speedier methods for slag analysis have been investigated and particular attention has been paid to the estimation of alumina.

Methods of analysis for small amounts of residual elements in cast iron are being studied. This is concerned in the first place with the determination of small amounts of lead, antimony, boron and arsenic. Work has been carried out on the spectrographic analysis of slags and an apparently promising method has been established.

The Association is participating with three other interested research associations, in a project being undertaken by Associated Electrical Industries, Limited, at their Aldermaston laboratories, with the object of developing an electron probe analyser which would permit the analysis of a considerable number of elements in metallurgical structures at any given point.

Fuels and Furnaces

Plans have been formulated for equipping the new experimental melting shop with a twin cupola unit to work with cold- or hot-blast, with detachable well and melting zone sections, and with flared melting zone sections, and lined to approximately 30-in. internal diameter. The normal melting rate is expected to be 3 tons per hour, but greater melting rates are expected in some circumstances. This planning has involved the design of a stock yard, charging system, cupolas, and the use of a pig-casting machine. The design has been completed and approved, and specifications are in the hands of suppliers. It is proposed to study the influence of stack resistance on cupola melting operations, dephosphorization using basic slag, and silicon and carbon pick-up using high melting temperatures. The blast heater, which will be oil-fired, has been designed to give blast temperatures of up to 750 to 800 deg. C. Provision for water cooling the shell and for various types of lining has also been made.

Moulding and Core Sands

The success of the machine designed by the Association's staff employing the principle of dielectric heating for testing sands at high temperatures has resulted in requests for an examination to be made of the possibility of building a machine to enable a faster rate of heating to be obtained. Consideration of these problems has begun. Using this apparatus, the following variables have been studied: the grading of sand grains, the replacement of coal-dust and wood-flour by peat, the expansion of moulding sand, and the high-temperature properties of sands containing coal-dust and wood-flour. Methods have been studied for obtaining a rapid means for measuring and recording the moisture content of sand in a mechanized system.

In connection with the CO_2 Process, the technique for the preparation of test-pieces and their subsequent treatment with CO_2 has been established, and using this technique the influence of moisture content, the inclusion of inferior sand, silicate ratio, clay content and gas evolution have been studied. The influence of the inclusion of sand, previously prepared for the CO_2 Process, and usually regarded as unusable in normal clay-bonded sand, has also been examined.

Gases in Cast Iron

The work carried out during the last year has been largely concerned with the influence of hydrogen in cast iron. Satisfactory sampling techniques have been evolved, the hydrogen generally being determined by vacuum heating. The part played by hydrogen in the titanium/CO_2 Process has been studied, and the influence of the CO_2 has been shown to be due to the elimination of hydrogen.

Considerable work has been carried out on the influence of metal composition, moulding sand and casting temperature on the pick-up of hydrogen from sand moulds. Experiments have been carried out on the problem of pinholing in ordinary and nodular cast irons. The influence of aluminium and titanium, in particular, have been studied. The structure of pinholes has been examined and some useful information has come to light.

Light Castings

Work has been carried out to determine the minimum sections which can be cast using ordinary green-sand moulding techniques. Factors influencing the chilling of light castings have been studied and an attempt has been made to give an indication of the permissible limits for chromium in light castings. The influence of melting and pouring temperatures on the chilling tendency in light castings has been studied. Work has continued on the gases evolved during heating of cast-iron samples during vitreous enamelling.

White and Malleable Cast Irons

Work has been begun on the factors influencing the eutectic structure of white cast iron. Superheating has been shown to give undercooling of the eutectic with the formation of an acicular white-iron structure. The use of the polarizing microscope to study the eutectic cell size and number in white cast irons has been explored. The relation between eutectic cell size and the dispersion of the mottled zone in chilled irons is being studied for various degrees of liquid metal superheating. Some interesting results have been obtained in work carried out to study the influence of test-piece size on apparent chilling tendency. An analysis has been completed of several methods for the casting of sound malleable-iron test-bars. An apparatus has been built to study weight changes during the decarburization of cast iron. This apparatus is being used to study factors influencing rate of decarburization and also sulphur pick-up during annealing.

Graphite Formation

A theory has been developed to explain the structure of ordinary grey cast iron in terms of eutectic cell size and number. To test this theory, experiments have been begun on the influence of inoculation and superheating on eutectic cell number and mechanical properties.

Ingot Moulds

Work on ingot moulds is carried out in co-operation with the appropriate sub-committee of the British Iron and Steel Research Association. The

BCIRA—Annual Report

possibility of carrying out thermal-shock tests on large specimens in the laboratory has been explored. A survey of the residual element content of pig-irons used by ingot mould makers has been begun. In co-operation with several manufacturers, factors influencing bottom plate life have been studied. A survey of the problems of the soundness of ingot moulds has been begun.

Development Department

The Development Department continues to devote its time to maintaining contact with members of the Association and dealing with their problems. The number of enquiries received during the year exceeded those of the previous year, and is now over six per working day. In dealing with them, over 400 visits were paid by the staff to member-firms, involving more than 300 members. This is, of course, additional to visits mentioned below in connection with foundry atmospheres and operational work.

There is an increase in the number of engineering works approaching the Association for advice on the types of iron required for particular projects and applications, and for discussions on the design of components. Within the limits of size of casting which it is practicable for the Association to make, the manufacture of prototype castings has been of particular value, especially where nodular cast iron is involved, and where satisfactory service trial is a necessary preliminary to adoption. Another important section of the Department deals with the use of fuel and the performance of melting equipment. The problem of coke quality is one which is constantly before the staff. Work on fuel economy and increased melting efficiency forms part of the Conditional Aid programme.

Foundry Atmospheres Section

The work of this section comprises the advisory services, supported by Conditional Aid, and experimental work on dust flow and dust control. The advisory services dealt with 126 enquiries specifically relating to dust and dust control, including certain problems arising out of the Clean Air Act, 1956, and these enquiries entailed visits to 74 foundries. In addition, advice has been given to nine foundries on knock-out or general ventilation problems involving, in most cases, several visits to each foundry.

Following the conference held at Harrogate during 1955 on foundry ventilation and dust control, the *Proceedings* were issued in book form during the year, although the production was sadly hampered by the printing dispute. About 500 copies of this book have been sold. Member-firms faced with problems arising from the Iron and Steel Foundries Regulations, now in force, and from the Clean Air Act, 1956, are urged to obtain this volume, which is made available to them at the cost of printing and distribution, £2. Copies are also available to non-members for £3. The book has been well received by reviewers and records information which is of value to practically every section of the industry, with reference to the control of dust, fume and air flow. At least one foundry knock-out based on the principles outlined in the book is in active and very satisfactory operation. It is believed that knock-out installations can now be designed by ventilating engineers with the certainty that dust control will be satisfactory. Work on the design of modifications to existing appliances to permit dust control has continued, and the application in industry of the external system of dust control for pedestal grinders has made good progress. The Association has actively assisted the Joint Iron Council in the discussions arising out of the Clean Air Act, now passed into law.

The Association is collaborating with the Electrical Engineering Department of the University of Birmingham on an idea with respect to dust control originally suggested by Mr. W. D. Bamford of the Association's foundry atmospheres section, and the work is sponsored by the Central Electricity Authority, to whom the Association is greatly indebted for its interest.

Scottish Laboratories

The Scottish laboratories carry out similar advisory work north of the Border and their equipment has recently been extended.

Operational Research Team

The continued illness of Mr. J. Hunter has limited the number of active members of the Research Team to two. During the year, 64 visits were made to foundries and reported on to the member-firms concerned. The Team has now paid more than 650 visits to foundries of member-firms since its inception in June, 1950. Sometimes the advice required is confined to specific subjects, and some 18 visits dealt with such items as coreshop and fettling-shop lay-out, impeller-rammer practice, cupola charging, scrap analysis, and pattern storage.

The Association is conscious that no absolute standard exists whereby the productivity of a given foundry may be judged, although, of course, improvements in productivity following the work of the Team can be assessed by the foundries concerned. It is hoped, however, in the course of time to evolve standards which will make it possible to arrive at a reasonably sound assessment of an absolute character with respect to productivity and it is already possible to do this with respect to the crew engaged on cupola melting, having regard to the method of charging, the number of men employed, and the output of molten metal.

Publications

The regularity of publication of the bi-monthly *Journal* and *Bulletin* was affected by the dispute in the printing industry, but with the August *Journal* it is hoped that it will be back to normal. The *Journal* carried 22 reports, and the *Bulletin* had extensive bibliographies of the CO_2 Process and of the principles of casting design.

(The Report is to be presented at the annual general meeting of the Association, in London, on November 6.)

Fifteen external reports to outside bodies appeared during the year and have been made available to members. Eleven of these were by members of the staff, who also gave 28 lectures to a number of technical bodies. In January the director recorded a contribution on the Association to the BBC Midland Regional programme. Also in January, a new series of BCIRA *Broadsheets* was initiated, the first dealing with methods of controlling external dust from the cupola, and of special interest in view of the Clean Air Act, 1956.

Conferences

A conference on the CO_2 Process held in March, 1956, was so successful that it had to be repeated in May, a total attendance of 484 being recorded. A full report of the papers and discussions appeared in the August issue of the BCIRA *Journal*. The conference planned for November, 1956, on the engineering applications of iron castings will be the sixteenth held since 1948.

Enquiries

Enquiries dealt with by the Department, and the loans of books, periodicals and other publications from the library, again showed an increase. Advice was sought during the year by several bodies on the organization of information and library services, based on the Association's experience.

Visits to Headquarters

The number of those concerned with the industry visiting headquarters is of the order of three per working day, and this year included 31 visitors from overseas, all five continents being represented. The Association has also been pleased to welcome several parties of visitors from trade associations and technical bodies.

Foundry Education

The National Foundry College, which is strongly supported by the Association, continues to make progress. Courses for foundry supervisors, which began in the form of a pilot course originated jointly by the Association and the Council of Ironfoundry Associations in April, 1955, are now regularly held three times a year (one in each vacation) under the aegis of the Council of Ironfoundry Associations.

Membership and Staff

The total membership of the Association in all classes at the end of August, 1956, was 1,328. The total staff was 122, of which 98 are employed in a scientific or technical capacity. The Report is signed by Mr. S. H. Russell, the president; Mr. J. J. Sheehan, the chairman of the Council; and Mr. J. G. Pearce, the director.

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 5s.)

755,664. Buderus'sche Eisenwerke, 52-56 Sophienstrasse, Wetzlar, Germany.

A method of manufacturing cast-iron pipes or other elongated hollow articles using the centrifugal casting process, with a horizontally arranged chill mould. A relatively high-grade cast iron, preferably a grey cast iron having graphite, which separates out in a compact, non-laminar and even spheroidal form on solidification, is cast in the chill mould to form a hollow billet with relatively thick walls. The billet is thereafter transferred directly, and without avoidable loss of temperature, to a heated chamber in which it is subjected to a heat-treatment. The billet is then brought to the dimensions of the final article by rolling, drawing, forging, etc.

756,012. Climax Molybdenum Company, 500 5th Avenue, New York, USA.

A cast molybdenum-base alloy which consists of at least 70 per cent. molybdenum, or 70 per cent. molybdenum and tungsten with the percentage of molybdenum exceeding that of the tungsten, and an essential alloying element selected from the group IVa of the periodic system in such an amount as to produce an alloy having a hardness of 200 UPN at 870 deg. C., that is, containing either from .25 to 14 per cent. titanium or from .10 to 2 per cent. zirconium. Such alloys are particularly applicable to the manufacture of gas turbine blades and other, similar items used at high temperatures.

756,364. American Wheelabrator and Equipment Corp., Mishawaka, Indiana, USA.

Steel shot for use in blast cleaning, peening, polishing, and similar processes. It relates particularly to an improved composition of the steel shot and a method for making the shot.

756,429. Olof Erik August Aspegren, Sveavegen 165, Stockholm, Sweden.

This invention is claimed to make possible the elimination of phosphorus from pig-iron at low cost, without necessitating the costly treatment in an electric furnace and without the carbon content of the iron having to be decreased to a lower value. An oxidizing gas is inserted below the surface of the molten metal. This gas contains more than 22 per cent. by volume of free oxygen. Together with the gas is a metal compound which reacts with oxidized phosphorus to form a metallic phosphate, which is subsequently removed.

756,550. National Research Development Corp., 1, Tilney Street, London, W.1.

An improved method for the production of shell moulds for making castings. The pattern is fixedly mounted upon a stationary table and an investment material is fed upon, and covers, the pattern. High-frequency or induction heating is applied to the investment material so that a plastic coating of investment material is formed upon the pattern. The surplus investment material is removed, and the plastic coating is then cured by continuation of the heating process.

756,618. Oesterreichisch-Alpine Montangesellschaft, 4, Friedrichstrasse, Vienna, 1, Austria.

A process for refining pig-iron to steel by blowing oxidizing gas mixture, particularly oxygen, on the bath surface from above. In this invention, the slag layer is pierced at the beginning of the blowing operation, within the impact area of the jet, with the aid of a solid body such as a rod of iron or steel.

756,756. Fairbairn Lawson Combe Barbour, Limited, Wellington Foundry, Leeds, 1, Yorks.

The production of castings by the shell-moulding process, the invention being more particularly concerned with the production of a machine for making shell moulds according to FIAT Report No. 1168. The machine consists essentially of three parts—the heating oven with a movable rack, a track or table assisting the transportation of the pattern from the oven to the investing box, and subsequently for assisting in the removal of the completed shell, and an invertible box carrying the ready-mixed powder used for investment.

Foundry Trades' Equipment and Supplies Association

Annual Report

At the annual general meeting of the Foundry Trades' Equipment and Supplies Association, held at the Waldorf Hotel on October 23, the following report of the year's activities up to December 31, 1955, was presented.

Membership

The number of members of the Association at December 31, 1955 was 70, and compared with the membership for the previous year, this indicates an increase of two members.

Accounts

The accounts of the Association for the year ended December 31, 1955 show an excess of expenditure over income amounting to £14 11s. 8d. The reason for this deficit is due to the fact that it has been necessary to reprint the Memorandum and Articles of Association, an expense which will not recur for some considerable time.

Council

During the year 1955, the Council held seven meetings and numerous matters of interest to members have been circularized.

Circulars

There has been an increase in the number of trade enquiries received by the Association, and particulars of these have been circulated to interested members. Also, members have been kept informed of various other matters and events which have taken place.

Articles of Association

The Council considered that the Articles of Association should be amended to bring them into line with the Companies Act 1948, and a resolution covering the alterations was proposed and passed as a special resolution at an extraordinary general meeting held in October, 1955.

Handbook

At the previous annual general meeting of the Association, it was unanimously agreed that a further edition of the British Foundry Plant & Supplies Handbook should be produced and, in this connection, the handbook committee has held a number of meetings to compile the necessary data to be included in the third edition, which will be published early in 1957.

Ventilation Committee (Pedestal Grinders)

Several meetings have taken place between interested members and the British Steel Castings Research Association for the purpose of concluding matters relating to modifications to pedestal grinders. In addition, investigations have also been carried out in regard to dust extraction on swing-frame grinders and the work of the committee continued under the chairmanship of Mr. G. E. Lunt.

Institute of British Foundrymen

In 1955 the second International Foundry Congress took place in London and on this occasion members of the Association contributed to a total amount of £537 13s 0d. towards the expenses incurred by the Institute.

National Union of Manufacturers

By reason of the fact that this Association is a member of the National Union of Manufacturers, individual members who join this body receive a rebate of 20 per cent. off their annual subscription to that organization. The Association has given its full support on various matters which have affected members of the NUM and Mr. D. H. Wood has continued as the Association's representative on its Executive Council.

British Standards Institution

Mr. J. G. Lowe has continued to represent the Association on the technical committee of the Institution and work was commenced on a British code for standard wood-pattern equipment.

Standardization of Steel Foundry Ladles

Following an approach by the British Steel Castings Research Association, several meetings have taken place with representatives from this Association to consider the matter. Arising from these discussions, a specification for steel foundry geared ladles was published by the BSCRA which indicated that the purpose of this was to provide an economic degree of standardization in ladle capacities and dimensions and to ensure that design and construction conformed to a high standard of safety.

THE NEW PRESIDENT, MR. G. E. LUNT.

Council of Ironfoundry Associations

A representative attended a meeting of the safety committee of the above organization at which consideration was given to the question of incorporating safety devices in foundry machinery. Subsequently, this Association communicated with the Chief Inspector of Factories to ask if it would be possible to give a ruling on adequate safety appliances fixed to any machines manufactured by members and a copy of the reply was published in Circular No. 65 dated April 4, 1956. It is understood that the safety committee has asked members of the Council of Ironfoundry Associations to provide particulars of specific cases where more adequate safety devices or guards might be fitted by the manufacturers of foundry machines and details in this connection are awaited.

Foundry Trades Exhibition

The Association maintained close co-operation with the organizers of the Foundry Trade Exhibition which was incorporated in the Engineering, Marine and Welding Exhibition held in September, 1955.

General

In concluding the report, the members of the Council wish to extend grateful acknowledgment to members whose services have been given for the benefit of both the Association and the foundry industry.

Election of Officers

At a subsequent Council meeting, the following officers were elected: As president: Mr. G. E. Lunt, of Bradley & Foster, Limited (whose portrait is printed on this page), and as vice-president Mr. G. C. Paterson, B.SC., of Paterson Hughes Engineering Company, Limited. The Council of the Association was re-elected *en bloc*.

Institute Elects New Members

At the Council meeting held in London on October 20 this year, the following were admitted to membership of the Institute of British Foundrymen in the grades indicated below:—

AS SUBSCRIBING FIRMS

Carbon Dioxide Company, Limited, London, W.1.
C. Ebeling & Sons (Pty.), Limited, Yarraville, Melbourne, Australia (Representative: J. D. Ebeling).
Foundry Services S.A. (Pty.), Limited, Johannesburg, South Africa (Representative: B. G. Pidermann).
Goldendale Iron Company, Limited, Tunstall, Stoke-on-Trent (Representative: C. J. Dale).
E. L. Midgley S.A. (Pty.), Limited, Johannesburg, South Africa (Representative: R. P. Maddern).

AS MEMBERS

J. R. Allan (Acme Companies, Walsall, Staffs).
T. Ashby, A. G. Wild & Company, Limited, Sheffield, 2.
G. W. Barnes, Barnes Engineering Company, Limited, Johannesburg, South Africa.
H. Brookes, Lowe & Brookes, Limited, Blackheath, Birmingham.
J. H. Cannon, Cullinan Refractories, Limited, Olifantsfontein, Transvaal, South Africa.
B. J. Church, Patternmakers (Coventry), Limited, Coventry.
B. Cordall, Newcast Foundries, Limited, Newcastle under Lyme, Staffs.
C. J. Dale, Goldendale Iron Company, Limited.
J. E. Dalton, Manor Precision Foundry (Ossett), Limited, Ossett, Yorks.
S. B. Dew, H. J. Maybrey & Company, Limited, London, S.E.26.
E. Elliott, Aluminium Development Association, London, W.1.
E. Erno, Kristiania Kunst Metalstoberi A/S, Oslo, Norway.
L. R. Evans, English Steel Castings Corporation, Limited, Sheffield.
D. M. Fulton, Birmingham Aluminium (1903), Company Limited, Smethwick, Birmingham.
W. Gorgen, Albion Foundry, West Johannesburg, South Africa.
B. M. Hardman, North Staffs Technical College, Stoke-on-Trent.
J. V. G. Horsburgh, Shell Mould Casting Company (Pty.), Limited, Benoni, South Africa.
G. Jenkins, W. E. Sykes, Limited, Staines, Middlesex.
P. C. Kasliwal, Vijai Metal Industries, Jaipur, India.
Ivy Ruth Kulik, Drury Brothers, Ash Vale, Hants.
K. S. Lavers, K. S. Lavers & Company (Pty.), Limited, Springs, Transvaal, South Africa.
B. J. Lombard, Central Engineering Works (Pty.), Limited, Johannesburg, South Africa.
R. P. Maddern, E. L. Midgley S.A. (Pty.), Limited, Johannesburg, South Africa.
H. O. Nilsen, S. & M. Engineering Works, Limited, Johannesburg, South Africa.
W. H. B. Noble, B. Berold & Company, Limited, Germiston, Transvaal, South Africa.
W. F. Richards, Walrich Brass & Aluminium Foundry, Maraisburg, Transvaal, South Africa.
S. B. Sengupta, India Government Mint, Calcutta, India.
D. K. Southwick, Bradley & Foster, Limited, Darlaston, Staffs.
S. J. Venning, Eclipse Engineering, Limited, Benoni, Transvaal, South Africa.
R. E. F. Wise, Campbell, Gifford & Morton, Limited, Weybridge, Surrey.
R. Ziegler, Oesterreichisches Giesserei-Institut, Leoben, Austria.

TRANSFERS FROM ASSOCIATE MEMBER TO MEMBER

K. H. Coombes, Polygram Shell Mould Company (Pty.), Limited, Benoni, Transvaal, South Africa.
G. H. Ford, City Engineering Works, Pretoria, South Africa.
K. L. Futter, Safsel (Pty.), Limited, Johannesburg, South Africa.
H. A. Godwin, East Rand Engineering Company, Limited, Germiston, South Africa.
A. A. Guest, Safanco, Limited, Johannesburg, South Africa.
A. Issaakidis, Forest Engineering Company, Johannesburg, South Africa.
C. McCormick, Mandy Engineering Company, Brakpan, South Africa.
D. D. Marais, Vanderbijl Engineering Corporation, Vanderbijl Park, South Africa.
G. K. Melvill, Mono Weld Tubes, Johannesburg, South Africa.
R. Mercer, Enfield Rolling Mills (Aluminium), Limited, Bradford, Yorks.
J. L. Mitchell, Grahamston Iron Company, Limited, Falkirk, Stirling.
J. A. Musk, Hayward Tyler & Company, Limited, Luton, Beds.
B. G. Pidermann, Foundry Services S.A. (Pty.), Limited, Johannesburg, South Africa.
S. Pienarr, African Malleable Foundries, Benoni South, Transvaal, South Africa.
J. Robertson, Technical College, Pietermaritzburg, Natal, South Africa.
J. R. Smith, C. & B. Smith, Limited, Wolverhampton.
G. A. Southern, Metropolitan-Vickers Electrical Company, Limited, Manchester.
V. F. Williams, S.A.R. & H. (Mechanical), Pretoria, South Africa.

AS ASSOCIATE MEMBERS

A. L. Blake, East Sussex Engineering Company, Limited, Lewes, Sussex.
G. D. Bowers, Harvey & Longstaffe, Limited, Ancoats, Manchester.
S. C. Carnie, Carron Company (S.A.), Limited, Germiston, Transvaal, South Africa.
K. R. Chakrabarty, Lakshmi Engineering Works, Delhi-Shadra, India.
G. F. Coles, Dorset Iron Foundry Company, Limited, Poole, Dorset.
H. N. Cooper, Sentinel (Shrewsbury), Limited, Shrewsbury.
E. J. Dibden, Escher Wyss Austral Iron Works, Boksburg, South Africa.
D. N. Dobbins, Ford Motor Company, Limited, Dagenham, Essex.
C. Dunger, British Electro Metallurgical Company, Limited, Sheffield.
H. Estler, Johannesburg Foundry (Pty.), Limited, Denver, Johannesburg, South Africa.
G. A. Estman, Sangus Engineering, Wadeville, Transvaal, South Africa.
J. E. Evans, British Foundry Units, Limited, Chesterfield.
J. Feasby, Hepworth & Grandage, Limited, Bradford, Yorks.
E. Featherstone, T. H. Dick & Company, Limited, Hull, Yorks.
R. P. Forsyth, Barratt & Pillans, Luipaardsylei, South Africa.
L. Fox, Wm. Jessop & Sons, Limited, Sheffield).
W. W. Fraser, British Cast Iron Research Association, Blantyre, Scotland.
A. H. Fraser-Ellis, McMillan Foundries, Limited, Watford, Herts.
J. A. L. Garcin, South African Railways, Lyttleton, Transvaal, South Africa.
C. Gee, L. Gardner & Sons, Limited, Patricroft, near Manchester.
J. G. Gibb, W. Richards & Sons, Middlesbrough, Yorks.
H. Green, Newcast Foundries, Limited, Silverdale, Staffs.
S. G. Griessel, E.M.E.S. (Pty.), Limited, Germiston, Transvaal, South Africa.
G. Harrison, R. W. Crabtree & Sons, Leeds, Yorks.
H. V. Hill, J. Stone & Company (Charlton), Limited, London, S.E.7.
J. A. Hubbard, British Piston Ring Company, Limited, Coventry.
J. A. F. Jarvis, Goulds Foundries, Limited, Newport, Mon.
D. H. Jennings, Ford Motor Company, Limited, Dagenham, Essex.
A. W. Khan, c/o R. J. Hunt & Son, Limited, Birmingham.
N. F. Kinsey, Harlow Metal Company, Limited, Harlow, Essex.
J. L. Kruger G. Goslar (Pty.), Limited, Jeppe, South Africa.
P. McCormick, A. Robinsons & Company, Limited, Bootle, Liverpool.
J. Magner, Victor Kent (Tvl.) (Pty.), Limited, Johannesburg, South Africa.
R. Marshallsay, Glenboig Union Fireclay Company, Limited, Glenboig, Lanarkshire.
D. C. May, Bagshawe & Company, Limited, Dunstable, Beds.
H. L. Maver, R. Goodwin & Sons (Engineers), Limited, Stoke-on-Trent.
W. A. Mears, British Piston Ring Company, Limited.
**J. Mills, John Mills & Company (Llanidloes), Limited, Llanidloes, Mont.
H. F. Morris, Harold Andrews (Sheepbridge), Limited, Halesowen, Worcs.
R. Moffatt, English Steel Castings Corporation, Limited, Sheffield.
D. Parkinson, Qualters & Smith Brothers, Limited, Barnsley, Yorks.
C. W. J. Petzer, Safsel (Pty.), Limited, Johannesburg, South Africa.
F. D. Powell, Aeroplane & Motor Aluminium Castings Company, Limited, Birmingham, 24.
A. Ridgway, Harvey & Longstaffe, Limited.
R. E. J. Roberts, C. & B. Smith, Limited, Wolverhampton.

* With effect from January, 1957.

** Automatic transfer to member, September, 1957.

Institute Elects New Members

R. Robertson, Sangus Engineering Company, Germiston, Transvaal, South Africa.
J. M. Rollinson, Refined Iron Company (Darwen), Limited, Darwen, Lancs.
J. H. Sale, F. H. Lloyd & Company, Limited, Wednesbury, Staffs.
K. D. Sanyal, Ordnance Factory, Muradnagar, U.P. India.
P. Savage, International Combustion, Limited, Derby.
R. C. Saxby, East Rand Engineering Company, Germiston, Transvaal, South Africa.
L. F. Stansbie, Leicester, Lovell & Company, Limited, Southampton.
M. B. Steyn, Scaw Metals, Limited, Germiston, Transvaal, South Africa.
L. Wahl, Walrich Brass & Aluminium Foundry, Maraisburg, Transvaal, South Africa.
J. H. Van Rooyen, African Malleable Foundries, Limited, Benoni South, South Africa.
B. Vaughan, Wm. Cumming & Company, Limited, Maryhill, Glasgow.
K. Walton, Gateshead Education Committee, Gateshead, Co. Durham.
G. W. Wells, Aeroplane & Motor Aluminium Castings Company, Limited.
L. Willis, L. Gardner & Sons, Limited, Patricroft, Manchester.
C. D. Wilson, South African Iron & Steel Corporation, Pretoria, South Africa.
H. W. Wright, British Piston Ring Company, Limited.
E. S. Young, Dyson & Company, Enfield (1919), Limited, Middlesex.

TRANSFERS FROM ASSOCIATE TO ASSOCIATE MEMBER

K. Arnold, Brightside Foundry & Engineering Company, Limited, Sheffield.
E. C. Collins, General Motors Holdens, Limited, Port Melbourne, Australia.
J. W. Crampton, Denver Metal Works, Transvaal, South Africa.
S. F. Crowe, G. Glancey, Limited, Halesowen, Staffs.
J. R. Ellis, English Electric Company, Limited, Bradford, Yorks.
D. Ford, Ruston & Hornsby, Limited, Lincoln.
R. S. Hill, Beech Hill & Company, Limited, West Bromwich, Staffs.
H. Kauserud, International Mechanite Metal Company, Limited, Epsom, Surrey.
F. J. G. Kenaghan, A.E.O. SMM Division, A.W.R.E. Aldermaston.
W. R. Kerr, Kerr Pattern Company, Limited, Lincoln.
D. Morris, A.P.V. Paramount, Limited, Crawley, Sussex.
D. P. Neogy, Planning Section, Ordnance Factory, Muradnagar, U.P. India.
F. G. Passam, Lloyds (Burton), Limited, Burton-on-Trent, Staffs.
W. R. Reeve, Ruston & Hornsby, Limited, Lincoln.
G. Singh, Greysham & Company, Fatchpuri, Delhi, India.
J. D. Smeeton, National Borehole Supplies, Germiston, Transvaal, South Africa.
T. Walton, Goodwin Barsby & Company, Limited, Leicester.
H. R. G. Whyte, S.M.T. (London Works), Johnstone, Renfrewshire.

ASSOCIATES (over 21)

M. Atkinson, Osborne Foundry & Engineering Company, Limited.
A. N. Chadd, Locomotive Workshops, Freelandguni, Dohad (W. Rly.), India.
S. C. Chakraborty, student, Leeds University Union, Leeds.
A. D. Cooper, Rolls Royce, Limited, Derby.
J. W. Gillett, J. Stone & Company, Limited, Charlton, London.
G. Huggan, Enfield Rolling Mills (Aluminium), Limited, Bradford, Yorks.
S. D. Jeffrey, Federated Foundries, Limited, Glasgow.
***D. H. Jennings, Ford Motor Company, Limited, Dagenham, Essex.
E. W. Karstaedt, Denver Metal Works.
A. Krinsky, Universal Manufacturing Engineers (Pty.), Limited, Bertrams, Johannesburg, South Africa.
R. H. Lethbridge, Guest, Keen Iron & Steel Company, Limited, Cardiff.
T. G. J. Milligan, Sangus Engineering Company, Germiston, Transvaal, South Africa.
C. D. J. Parker, Douglas (Kingswood), Limited, Bristol.
W. L. Richardson, Francis & Graham, Mobeni, Durban, South Africa.
J. G. Sandlan, Hardie & Gordon, Dumbarton.
D. A. Scotford, Castings, Limited, Walsall, Staffs.
R. T. Swann, Morris Motors, Limited, Wellingborough, Northants.
B. J. Templar, John Hill & Son, Limited, Wolverhampton.

*** Automatic transfer to associate member, April, 1958.

ASSOCIATES (under 21)

R. K. Cook, Bridge Foundry Company, Limited, Wednesbury, Staffs.
J. L. Cox, Stothert & Pitt, Limited, Bath.
G. T. Edwards, Cannon Industries, Limited, Deepfields, near Bilston, Staffs.
P. R. Green, Bridge Foundry Company, Limited.
J. A. Harmston, Samuel Osborn & Company, Limited, Sheffield.
T. W. Lodge, Samuel Osborn & Company, Limited.
B. Maylor, John Hall & Son, Limited, Oldham, Lancs.
T. Mitchell, Samuel Osborn & Company, Limited.
D. Morley, Samuel Osborn & Company, Limited.
A. Pearson, Samuel Osborn & Company, Limited.
J. P. Reid, Anderson Boyes, Flemington, Motherwell.
P. T. Roberts, Bridge Foundry Company, Limited.
A. Rollin, E. Joplings & Sons, Limited, Pallion, Sunderland.
A. Siddall, Samuel Osborn & Company, Limited.
H. L. Walker, Samuel Osborn & Company, Limited.
W. F. White, Samuel Osborn & Company, Limited.
G. Whittaker, Samuel Osborn & Company, Limited.

Company News

PROJECTILE & ENGINEERING COMPANY, LIMITED—As production and profits have been adversely affected by a trade recession, the company is not paying an interim ordinary dividend. Last year an interim of 2½ per cent. was followed by a final of 7½ per cent.

SPARK ALLOYS, LIMITED—Group profit, before tax, for the year to March 31, 1956, was £20,987, compared with a loss of £11,060 for the previous year. The dividend is 15 per cent. (nil), together with an interim of 5 per cent. (same) for the current year.

WOMBWELL FOUNDRY & ENGINEERING COMPANY, LIMITED—While the interim dividend was cut by 1 per cent. to 5 per cent., the final is raised by 2 per cent. to 11 per cent., giving a total of 16 per cent. (15 per cent.). Net profits for the year to July 31 rose from £15,640 to £21,199 after tax of £27,776 (£13,209).

R. & W. HAWTHORN, LESLIE & COMPANY, LIMITED—The directors recommend a final dividend of 15 per cent. (12 per cent. last year) on the £1,343,531 ordinary shares. With an unchanged 5 per cent. interim the total for the year to June 30, 1956, is 20 (17) per cent. Group profits, before taxation, are £1,083,253 (£901,008). Tax provision is £574,910 (£478,113), leaving a net profit of £508,343 (£422,895).

W. E. SYKES, LIMITED, manufacturers of gear-cutting and measuring machines, of Staines (Middx)—A marketing is being arranged of a portion of the equity. Issued capital is £720,000 in £420,000 6½ per cent. cumulative preference £1 shares, £100,000 "A" ordinary 10s. shares, and £200,000 "B" non-voting ordinary 10s. shares. Application has been made for permission to deal and quotation for the whole of the issued preference and "B" non-voting shares. Profits in the past 10 years have shown marked expansion, reaching £271,000 (before tax) for the year to April 30, 1956.

LAKE & ELLIOT, LIMITED, manufacturers of iron and steel castings, of Braintree (Essex)—Orders are about the same as a year ago and the steelfoundry has achieved high output. The ironfoundry has been operating economically at a reduced level of output. Sale of Millenium-Key refinery fittings has exceeded £1,000,000 since the 1950 agreement with the Key Company of the US. Consolidated profit (including the new subsidiary, National Steel Foundry (1914), Limited) for 10½ months amounted to £208,153 (after tax). Ordinary dividend is again 12½ per cent., but the final of 7½ per cent. is on capital increased by a 66⅔ per cent. scrip issue.

Hallsworth Automatic Moulding Unit

Installation at Platt Malleable Castings Limited

The Hallsworth automatic moulding unit*, after preliminary trials, was formally inaugurated at a function opened by Mr. A. G. B. Owen, C.B.E. (the chairman of the Owen organization which installed the plant) and Mr. Gilbert Harvey (the joint managing director of Platt Malleable Castings, Limited). Platt Malleable Castings, Limited, is the first concern to use this equipment. Three of the first castings made had been gold plated and were presented to those primarily concerned with the design and functioning of the plant, the general appearance of which is shown in Fig. 1. The sand-preparation plant, which is ancillary to the moulding system, has been supplied by Pneulec, Limited, and does not radically depart from their standard design. In the method of working at the foundry, for the changeover from batch to continuous production, the cupola had to be lined down and here, teething troubles were anticipated and met by the installation of an oil-fired holding furnace situated contiguous to the pouring unit. To operate the sand-conditioning plant, the moulding unit, the conveyors and the furnace, about 26 h.p. is required. Essentially, the unit is a fast production one—one half-box in 8 sec.—using small (12 by 9 by 5-in.) boxes.

Moulding Machine

The Hallsworth moulding machine (Fig. 2) is characterized by having four stations carried on a rotary table. The operator receives the moulding boxes from a roller conveyor and before placing one on the machine, blows off any sand adhering to the patternplate and then releases the hinged sand-allowance frame on to the box. Hereafter, every action is automatic. In its passage to the second station, the patternplate is sprayed with a parting fluid. Here, from a rotary hopper turning through 180 deg., the box receives a predetermined quantity of sand whilst a frame descending from the chute, tucks in the sand around the edges of the

* Briefly described in the JOURNAL'S "Equipment and Supplies" feature April 26, 1956, p. 237.

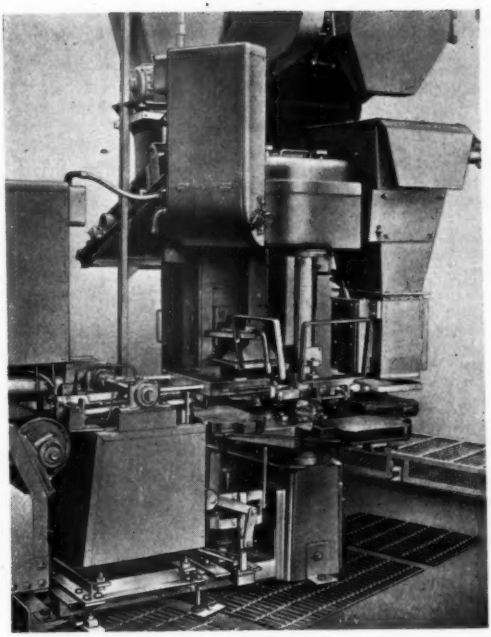


FIG. 2.—*Hallsworth moulding machine having four stations, carried on a rotary table.*

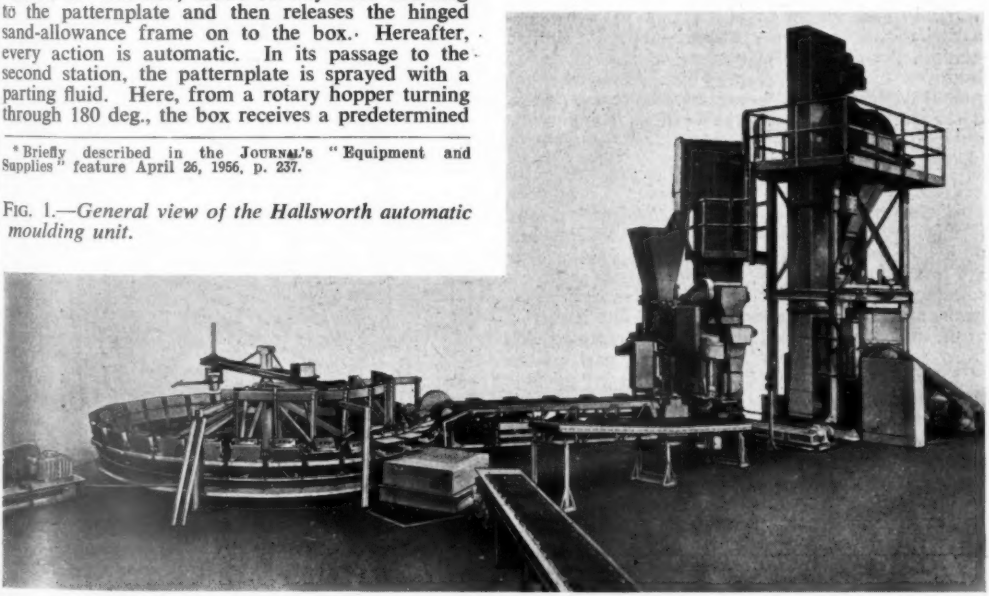


FIG. 1.—*General view of the Hallsworth automatic moulding unit.*

box. The box is then indexed to the third station where the sand is compressed. Between the third and the last station, the hinged frame assumes the vertical position to enable a bar to come into action to strickle off the surplus sand. At the last station, the patternplate is vibrated and the box is removed by a mechanism which places the half mould on to the mould-assembly conveyor. As no cores were required for the castings being made, all that was necessary was to put on the top-half, roughly strickling over the surface.

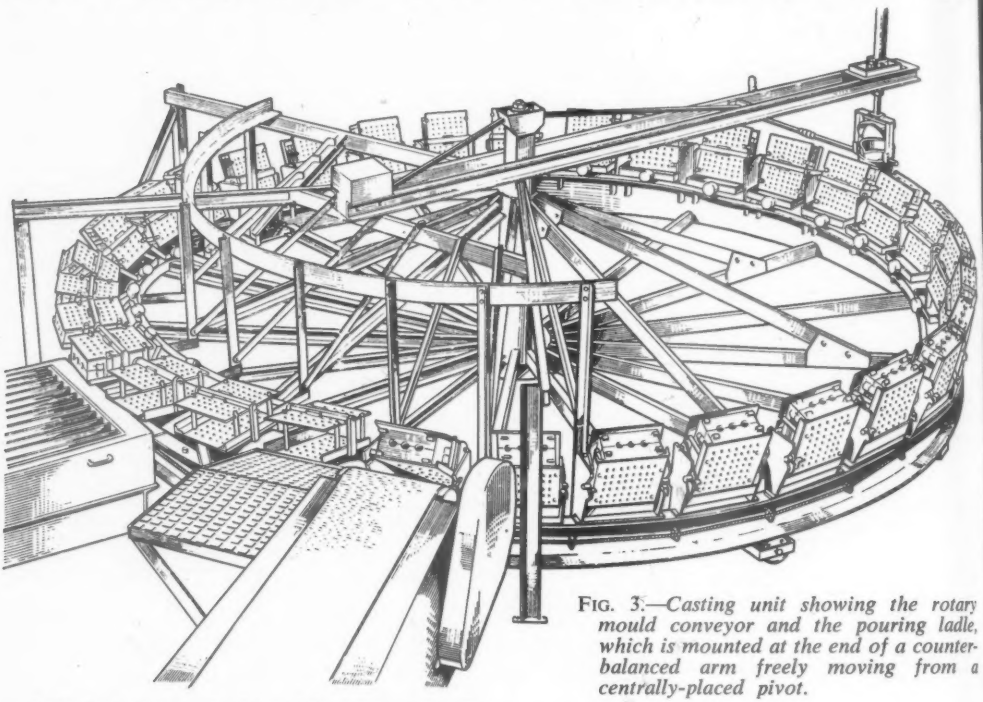


FIG. 3.—*Casting unit showing the rotary mould conveyor and the pouring ladle, which is mounted at the end of a counter-balanced arm freely moving from a centrally-placed pivot.*

Casting Unit

A view of the casting unit of the plant is shown in Fig. 3. It is so designed that for loading and unloading the boxes into the clamps (Fig. 4) the latter are in the horizontal position but quickly assume a suitable angle for pouring, slowly recovering the horizontal position afterwards. The ladle is carried at the end of a counter-balanced arm freely moving from a centrally-placed pivot. This part of the plant works splendidly for as whiteheart malleable was being cast, the metal was got into the moulds both quickly and efficiently with a minimum of effort. On arrival opposite to the knock-out—the smallest model made by Sterling Foundry Specialties, Limited—the mould is withdrawn from its now unclamped "drawer" and placed on the grid. The castings are placed on a wire-mesh conveyor whilst a second man cools the box-parts by plunging them in a tank containing cold water (This section of the plant needs a little more thought devoted to it as it seems a pity that such a fine example of automatic manufacture should require the services of one

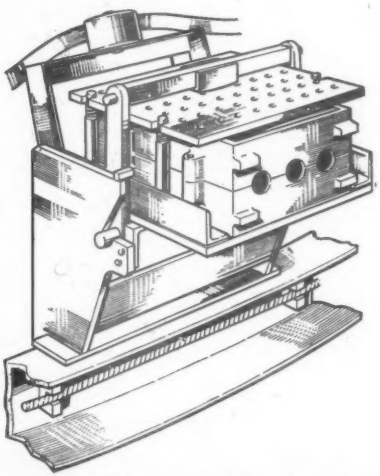


FIG. 4.—*View of the clamping mechanism carried on the outer ring of the rotary track. Each unit consists of a base with a spring-supported top and is pivotedly mounted about the bottom pallet between two specially-designed upright supports.*

man to dip and place on a conveyor some 480 box-parts per hour).

The plant is well provided with strategically-placed emergency switches. Provision is made for the easy and rapid changing of patterns. As a machine for the production of quantities of small castings such as is encountered in the malleable, grey-iron and non-ferrous trades, the plant shows high potentialities.

Newcastle Firm Denies Nuisance

Allegations of dust, noise, and vibration from the works of the Sutton Silica Company, Limited, Newcastle-under-Lyme, were denied by Mr. Ralph Lawton, the chairman of the company, at a public inquiry held in mid October. An efficient dust-extraction plant had been installed; £700 had been spent on enclosing machinery to reduce noise to a minimum, vibration would not be noticed if the area was used by heavy traffic and he denied machinery interfered with radio and television.

Local officials had been informed that the premises, formerly a foundry, would be used for the drying, grinding, and storage of silica, between September, 1954, and January, 1955. Production began in April and in May complaints were received about noise. He was then told he required planning permission as there had been a change of use. Application was made and was rejected by the town council. It was "extremely unsatisfactory to run a business when beset by such uncertainty and under the shadow of possible enforcement action," said Mr. Lawton.

It was stated for the council that the area was to be redeveloped and the site would be required for a technical school. The Mayor of Newcastle gave evidence that, with Mr. Stephen Swingler, MP, he had investigated complaints and at the inquiry objections were raised by 17 local residents.

Iron-ore Imports

Iron-ore imports in September, and the total for the first nine months of this year compared with the corresponding period of 1955, are shown below.

Destinations.	Month ended Sept. 30.	Nine months ended September 30.	
	1956.	1955.	1956.
	Tons.	Tons.	Tons.
Sierra Leone	43,390	495,700	499,209
Canada	383,020	870,958	1,810,874
Other Commonwealth countries and Eire	7	11,402	12,137
Sweden	321,268	2,905,184	3,266,794
Norway	5,266	76,042	64,493
Western Germany	—	29,931	3,100
France	51,976	477,094	478,625
Portugal	9,475	74,613	90,069
Spain	63,128	619,974	648,186
Algeria	94,019	1,725,671	1,135,003
Tunisia	85,010	586,121	595,274
French Morocco	—	199,829	287,600
French West Africa	18,700	373,735	450,586
Spanish Morocco	10,925	160,634	204,098
Liberia	9,750	221,361	247,641
Brazil	36,230	356,786	406,192
Other foreign countries	39,733	130,630	536,627
TOTAL	1,171,897	9,315,665	10,736,508

DSIR Finances

In the House of Commons last week Mr. Ian Mikardo (Lab.) asked the Parliamentary Secretary to the Ministry of Works (as representing the Lord President of the Council) whether he had yet considered the view of the Advisory Council to the Department of Scientific and Industrial Research that it would be necessary to revise the department's grants to research associations to take account of price rises, and what instructions he had given in this connection.

Replying Mr. J. R. Bevins said that the five-year plan for the expansion of the Department's activities from 1954 to 1959 provided for a financial review in the event of major variations in prices. A review had now taken place and, subject, of course, to annual votes, additional resources would be made available up to March, 1959, for grants for research associations and other purposes.

When Mr. Mikardo asked the Parliamentary Secretary what additional funds he proposed to make available to the DSIR in order to obviate the necessity, referred to in Command Paper No. 9690, of reducing other scientific grants in order to maintain the number of awards to post-graduate students, Mr. Bevins said that, as the department's receipts for payment services would be greater than had previously been estimated, it would be possible to maintain both the number of awards to post-graduate students and other scientific grants in 1956-57.

Midlands Labour Position Improves

Increasing unemployment and short-time working in the Midlands has been arrested, the Midland Regional Board for Industry was told on October 16. The recession in the car industry was largely responsible for the position, which is now showing "slight but definite improvement," said the chairman, Major C. R. Dibben.

Some industrial members of the board have reported great difficulty in getting new labour—even unskilled. The removal of the large number of workers on short-time from the unemployment register gives a more realistic picture and unemployment in the Midlands region now stands at the national average of 1.1 per cent. instead of double that figure in August. The number of wholly unemployed rose by 954 to 18,720, but the increase was doubly accounted for by the rise of 1,868 in unemployed women workers—largely mothers who have registered now that children have returned to school.

Sales campaigns by firms with established overseas markets had enabled them to maintain and increase exports, and industry generally in the Midlands was showing greater interest in exports, said Mr. Michael Halls, Regional Controller of the Board of Trade.

Steelworks Water Increases

The Bill for water for the Appleby-Frodingham Steel Company, Scunthorpe, may go up nearly 100 times if north Lincolnshire water boards are amalgamated.

At the public inquiry at the Town Hall, Grimsby, into the proposed order for amalgamating the water boards, it was stated on behalf of the United Steel Companies, Limited, that if the boards are amalgamated into one undertaking it will cost the Appleby-Frodingham Steel Company, £23,500 a year for water instead of the £300 paid by the company at the present time. John Lysaght's Scunthorpe Works, Limited, might have to pay £7,000 a year for water instead of £1,600.

News in Brief

MARLEY CYCLE SHEDS previously made to special order, are now in quantity production by Surrey Concrete, Limited, Peasmarsh, Guildford.

SANDWELL CASTING COMPANY, LIMITED, is planning to erect an extension to the pattern store in Bank Street, West Bromwich.

NEVILLE FOUNDRY COMPANY, LIMITED, Harrison Street, Holmes, Rotherham, is to establish an iron foundry at Sleaford, Lincs.

OUTPUT OF CARS and commercial vehicles in September was the lowest since 1952 and vehicle exports were the lowest September total for eight years.

WICKMAN, LIMITED, machine-tool manufacturers, etc., of Coventry—The directors announce the allocation of 350,000 ordinary £1 shares at par to the parent company—John Brown & Company, Limited. Payment is due on November 6.

PLANS for extensive reconstruction and modernization to meet foreign competition and building tankers of up to 100,000 tons were announced on October 23 by Mr. J. C. Mather, chairman of Cammell Laird & Company, Limited, Birkenhead.

FORMATION of an industrial safety centre in Scotland, similar to that functioning in Birmingham, was urged at a meeting of the Glasgow and District Industrial Accident Prevention Group by Mr. T. W. McCullough, HM deputy chief inspector of factories.

THE ANNUAL REPORT of the Institution of Works Managers 67/8 Chandos Place, London, W.C.2. shows that the membership now stands at 2,262 a, considerable increase on the previous year. It now operates about 20 branches; the president is Lord Piercy, C.B.E.

WORK has begun on a new factory for Cameron Iron Works, Limited, Leeds, a subsidiary of Cameron Iron, Inc., of Houston, Texas. It will cost £450,000 and it is hoped to complete it in 10 months. The firm manufactures valves and equipment for oil drilling.

ALUMINIUM IS SYMBOLIC of our generation, according to London's Lord Mayor-elect, Sir Cullum Welch, and the whole pageant of the Lord Mayor's show on November 9, is devoted to the one theme. The British Aluminium Company, Limited, is mounting the pageant.

A 34-ACRE SITE has been purchased by Birlec, Limited —a member of the AEI group—on which it is to build an electric-furnace manufacturing plant. A three-stage scheme allows for the completion of several bays by 1958 and the transfer of departments to the new plant in 1961 and 1966.

"FILMS IN THE SERVICE OF INDUSTRY" is the title of Britain's first festival of industrial films to be held at Harrogate next October. Producers and sponsors will be invited to enter films on a competitive basis. Headquarters of the festival is 3, Portman Chambers, 7-9, Baker Street, London, W.1.

ADDITIONAL SAMPLES from underground drifts and stopes in the Can-Erin's Mountain Mine of the Berehaven group in West Co. Cork are reported to have returned very encouraging copper values results. The old main shaft at the Mountain Mine was carried to a depth of 1,800 ft. and terminated in extremely rich ore.

OF INTEREST TO FOUNDRIES operating vitreous-enamelling departments is a symposium on grinding, organized by the Institution of Chemical Engineers, to be held on November 7 at the Royal Institution, Albermarle Street, London, W.1, beginning at 3 p.m. and ending at 7 o'clock. Details are available from the Institution, 56, Victoria Street, London, S.W.1.

W. J. FRASER & COMPANY, LIMITED, of Harold Hill, Romford, Essex, have been awarded a contract, worth approximately £750,000, for the complete installation of new nickel-refining plant at Clydach, S. Wales, for the Mond Nickel Company, Limited. The plant will carry out the final stage in the production of nickel, in which the pure metal is obtained by thermal decomposition of gaseous nickel carbonyl.

SIX JOURNALISTS from German newspapers and technical journals, who visited the East Hecla Works of Hadfields, Limited, Sheffield, at the end of last month, were received by Lord Dudley Gordon, the chairman, and Mr. H. Humphreys, the managing director. The visit was organized by the Central Office of Information and the party included Mr. P. W. R. C. Haley, the British Consul General in Düsseldorf.

THE British Transport Commission has placed contracts with British Insulated Callender's Cables, Limited, and British Insulated Callender's Construction Company, Limited, for the design, supply, and installation of the overhead conductor equipment for the railway electrification schemes between Manchester and Crewe (220 track miles) and Colchester and Clacton (50 track miles). Preliminary work on the former scheme has already begun.

MANCUNA ENGINEERING, LIMITED, have recently moved their London sales and design office from Oxford Street, London, W.1, to 59, Victoria Road, Surbiton, Surrey (telephone: Elmbridge 9793). This office covers the southern half of England, including South Wales, and is under the managership of Mr. R. A. LePage. Mr. N. S. Stedman, B.SC., A.C.G.I., who has recently joined the company, will be responsible for the design work of the London office.

A 1903 5 h.p. Vauxhall motor car has been entered by the Science Museum in the commemoration run from London to Brighton on Sunday, November 4, with the permission of the owner, Dr. A. Jefferson Bernhardt. This was the sixth car produced by the Vauxhall Iron Works Company, Limited, and has been in the possession of Dr. Bernhardt's family since 1904. After the run the car will be placed on exhibition in the Museum, having been lent to the National Collections for a long period.

THE BOARD OF TRADE reconstituted the Monopolies and Restrictive Practices Commission on October 31 in accordance with the Restrictive Trade Practices Act, 1956. The Commission will be known as the Monopolies Commission. At his own request, Sir David Cairns, Q.C., gave up his appointment as chairman at the end of October and will return to the Bar. Mr. Richard Francis Levy, Q.C., will be appointed chairman of the reconstituted Commission to-day, November 1, and the names of the other members will be announced shortly.

VOKES, LIMITED, filtration and silencing engineers, of Guildford (Surrey), has formed a subsidiary, Oxy-Catalyst Sales, Limited, in company with the Oxy-Catalyst Company, Limited. Its purpose is to market the "Oxycat," an oxydation catalyst designed to prevent air pollution by changing the dangerous elements in discharges from chimneys and exhausts into useful power and energy. The "Oxycat," which is stated to have been in use in the United States for a number of years, will be shown for the first time at the Public Works Exhibition at Olympia (November 12 to 17).

THE BOARD OF TRADE give notice that they are considering an application for increased protective duties on:—Antimony metal, in any form (including antimony

regulus); antimony oxides and mixtures containing not less than 85 per cent. by weight of antimony oxides expressed as antimony trioxide; and alloys of metal, in any form, containing not less than 85 per cent. by weight of antimony. Any representations which interested parties may wish to make in regard to this application should be addressed in writing to the Board of Trade, Tariff Division, Horse Guards Avenue, London, S.W.1, not later than November 17.

THE FOLLOWING APPOINTMENTS which took effect from October 29, have been announced by Incandescent Heat Company, Limited: MR. J. A. SWAIN has relinquished the post of sales manager, on his appointment as chief engineer of the Equiverse sales division, which has been specially created to deal with home and overseas orders and enquiries for furnaces incorporating this system of scale-free heating; Mr. H. C. NEWMAN, previously manager of the group's export division, has taken up management of the company's general sales division, and Mr. G. C. A. SMITH has been appointed manager of the export division for the Incandescent group.

ENGLISH STEEL CORPORATION, LIMITED, Sheffield, reports in its *Information Bulletin* that 19 agents representing 24 countries joined a conference recently held in Sheffield. It states, "The delegates expressed some concern at the rigid attitude of British industrialists towards the export markets and their apparent inability to meet foreign competitors on their own ground. A persistent undertone in all the discussions was the increasing world competition, especially in steel products. Steel and engineering are long-established industries and 'know-how' is no longer confined to a few highly industrialized countries." The *Bulletin* also says that the firm's modernization plans will require an ever-expanding market.

NUCLEAR ENGINEERING, LIMITED, manufacturers of gamma-radiographic containers and remote-control equipment for the non-destructive testing of castings, assemblies, weldments, etc., announce the appointment of the following regional agents and demonstrators: Sheffield—Welding Rods, Limited, Brightside House, Sheffield, 9 (Mr. W. S. Cocker); Newcastle-upon-Tyne—Anglo-Swedish Electric Welding Company, Limited, Glasshouse Street, St. Peters, Newcastle-upon-Tyne, 6 (Mr. W. Wilson); Scotland—Arc Manufacturing Company, Limited, Actarc Works, Nitshill, Glasgow, S.W.3 (Mr. L. Mills). In addition, Quasi-Arc, Limited, have agreed to hold a display container and remote-control apparatus in their Bilston showroom, where Mr. P. F. Wilks can provide demonstrations.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

AUSTRALIA, December 7—Electric overhead travelling crane, for the Brisbane City Council. (ESB/26766/56.)

INDIA, November 9—Cast-iron pipes and specials, for the Director-General of Supplies and Disposals. (ESB/26299/56.)

INDIA, November 14—Mobile cranes, for the Government of Madras State Port Officer. (ESB/26465/56.)

LIMAVADY, November 5—Providing and laying of approximately 2 900 yds. of 3-in. dia. spun-iron water main, for the Rural District Council. W. & M. Given, consulting engineers, 1, Waterside, Coleraine. (Deposit, £3 3s.)

PONTEFRACT, November 5—Furnishing and laying of about 4,800 yds. of 6-in. spun-iron water mains, with stop and air valves, hydrants, etc., for the Osgoldcross Rural District Council, Pontefract (Yorks). D. Balfour & Sons, consulting engineers, 131, Victoria Street, Westminster, London, S.W.1. (Deposit, £3.)

Forthcoming Events

NOVEMBER 5

Institute of British Foundrymen

Sheffield and district branch:—"Training," by O. W. Reynolds, and "Foundry Training," by H. Parkin, 7 p.m., at the Sheffield College of Commerce and Technology, Department of Engineering, Pond Street.

Lancashire branch:—"Fast-drying Bonding Materials," by A. I. Donaldson, 7 p.m., at the Midland Hotel, Manchester.

NOVEMBER 6

Sheffield Metallurgical Association

"Modern Trends in Metallurgical Analysis," by W. T. Elwell, 7 p.m., at the British Iron and Steel Research Association Laboratories, Hoyle Street, Sheffield, 3. (Joint meeting with the Royal Institute of Chemistry.)

Institute of Industrial Supervisors

Coventry section:—"The Foreman's Future," by A. B. Waring, 7.30 p.m., at the Sibree Hall, Warwick Row.

NOVEMBER 7

Institution of Production Engineers

South Essex section:—"New Metals—with Specific Reference to Titanium, Zirconium, Molybdenum, etc," by Dr. T. W. Farthing, 7.30 p.m., at the Ilford Club, 21a, Balfour Road, Ilford.

Incorporated Plant Engineers

London branch:—"Use of Radio-isotopes in Industry," by C. W. Jones, B.Sc., 7 p.m., at the Royal Society of Arts, John Adam Street, Strand, London, W.C.2.

Edinburgh branch:—"Choice of Pumps," 7 p.m., at 25, Charlotte Square.

Southern branch:—"Noise," by E. J. Richards, M.A., B.Sc., 7.30 p.m., at the Carnegie Library, Fratton Road, Portsmouth.

NOVEMBER 8

Institute of British Foundrymen

Beds/Herts section:—"Mechanizing a Small Jobbing Foundry," by R. H. Blandy, 7.30 p.m., at the Small Assembly Room, Town Hall, Luton.

Institute of Metals

Birmingham local section:—"Metallurgy of Steel for Deep Drawing and Pressing," by A. J. K. Honeyman, B.Sc., 6.30 p.m., at the Birmingham Exchange and Engineering Centre, Stephenson Place.

Institution of Works Managers

Wembley sub-branch:—"Accident Prevention," by Mr. Pepper, 12.45 p.m., at the G.E.C. Sports Pavilion, Preston Road, North Wembley.

Incorporated Plant Engineers

North-east branch:—"Engineering Economics," by T. S. Welch, 7 p.m., at Roadway House, Oxford Street, Newcastle upon Tyne.

Glasgow branch:—"Introduction to Atomic Energy," by J. A. Dixon, M.A., 7.15 p.m., at the Scottish Building Centre, 425/427, Sauchiehall Street.

NOVEMBER 9

Institute of British Foundrymen

Tees-side branch:—Annual Social Evening at the Teesdale Hall, Thornaby-on-Tees.

NOVEMBER 10

Institute of British Foundrymen

Newcastle and district branch:—"New Developments in the Founding of Non-ferrous Metals," by F. Hudson, 6 p.m., at the Neville Hall, Westgate Road, Newcastle upon Tyne.

Scottish branch:—"CO_2 Process—A Recap," by R. Spencer, 3 p.m., at the Royal Technical College, George Street, Glasgow.

Canadian Iron and Steel Output Up

Canadian output of steel ingots and pig-iron continued to rise in September. Steel ingot output increased by 14.4 per cent. to 419,966 tons, compared with 367,005 tons in September last year, and by 19.8 per cent. in the first nine months to 3,847,361 (3,210,801) tons.

The September output of pig-iron rose by 7 per cent. to 296,669 (276,795) tons, and in the first nine months of this year rose by 12 per cent. to 2,649,520 (2,354,034) tons. At January 1 rated ingot capacity of Canada's steel furnaces was 5,192,000 net tons per annum.

Raw Material Markets

Iron and Steel

From the furnaces now in blast approximately 75 per cent. of the pig-iron produced is in the steelmaking grade, while an appreciable tonnage of hematite is also consumed by the steelworks. In some areas, however, there is still a shortage, which will only be relieved when fresh units are blown in, and meanwhile the deficiency is being overcome partially by imports. So far as raw materials are concerned, the furnaces are well provided with iron and coke.

In the foundry grades of pig-iron, outputs are maintained, but demands are quiet from all sections of the trade. The engineering and speciality foundries continue to be the most favourably employed, although the extent of their commitments for high-duty castings is still subdued. Those supplying castings to the motor-vehicle trade are not heavily employed, although there has been a slight increase recently in their demands for pig-iron; this may have been necessitated by reduced stocks. The low-phosphorus pig-iron and hematite used by these foundries are plentiful.

Production of high-phosphorus pig-iron is adequate for current consumption. More work is needed by all the users of this grade, including the light, jobbing, and textile foundries. Orders now being placed are readily completed, and the foundries have no opportunity to add to their forward commitments. Most of the foundries are specifying only those tonnages of raw materials which are required to fulfil the orders on hand and do not appear inclined to add to stocks. It must be borne in mind, however, that no large stocks of any grade are being held either by the foundries or the furnaces; a slight overall increase in requirements would absorb these tonnages quickly. Further, with the increasing costs of production, the possibility of an increase in price levels cannot be ignored.

The foundries have good supplies of scrap, while coke is coming forward fairly well. Ganister, limestone, and firebricks are readily available.

Re-rollers are generally well placed for orders, and although there has been some falling off in demand from home users for small bars and light sections, they have still good order-books to enable them to maintain outputs at recent levels. The re-rollers have continued to dispose of their outputs to home users, but should these requirements fall, a ready market will be found overseas at attractive prices.

Non-ferrous Metals

The feature of the copper markets on both sides of the Atlantic has been the all-round price adjustment. Last week the copper market opened uneasy and apprehensive lest price changes would be made. In the event it was the unexpected cut in the Rhodesian Selection Trust fixed price by a further £15 to £26 5s. per ton—the second RST reduction within 10 days—that started the collapse of the American price structure. This had already gone some way towards realistic prices by the lowering of the Custom smelters' price by 2 cents to 37 cents and the fall in the price of scrap to below 27 cents a pound. But even so, the main producers were still holding the line at 40 cents until the RST reduction became known. This was obviously too much to countenance and Phelps-Dodge initiated a price cut of 4 cents to 36 cents a pound and was soon followed by Kennecott. Anaconda, however, did not come into line until the end of the week, presumably because of its close tie-up with the Chilean Government and the sale of its copper on the US market.

These events also caused a break on the London Metal Exchange and the settlement price on Thursday of last week was as low as £263 per ton. At this level activity was brisk and the settlement price recovered £10 on Friday. A secondary, but important, aspect of the week's events was the establishment of a contango. A further repercussion of the lowered copper price has been the announcement by Phelps-Dodge—the second largest US producer—to effect a 10 per cent. reduction in output by eliminating weekend work. Other major US producers are expected to follow suit. Meanwhile, the lowered prices have steadied the US market with copper scrap moving ahead ½ cent with dealers offering limited quantities.

Tin remains a quietly steady market both in London and in New York. The basic desiderata affecting this market are unchanged: demand is consistently good, spot supplies are scarce, and, political events—the Israel-Arab situation, the Suez crisis, and more recently the Singapore riots—are all bullish factors. On top of all this the International Tin Council, which met last week in London, has expressed the view that world supply and demand will remain in balance over the two years 1956-57.

Lead in London is steady but featureless with the price levels holding firm. In the States demand continues strong for both prompt and November metal. Battery manufacturers are stepping up their purchases, as their peak buying season is rapidly approaching. Trading continues on the basis of 16 cents per pound. Demand for zinc in London is erratic, but tending to be good, which has been reflected in a gradual rise in the price. In America business is reasonably good, with most of the demand being concentrated on "Prime Western" at 13½ cents a pound East St. Louis. However, diecasters are increasing their demands for special high grade, which may be a reflection of the stepping up of automobile production.

Official metal prices for yesterday (Wednesday) are given on p. 524.

Reorganization of Dundee Firms

There is to be a change-over in the type of work undertaken by Urquhart Lindsay & Robertson Orchar, Limited, in their Blackness and Wallace foundries, Dundee, according to a statement issued last month by Fairbairn Lawson Combe Barbour, Limited, associated with the former company. As part of the two-year reorganization plan referred to in the directors' report of November last, large-scale production reorganization between the F.L.C.B., Leeds, and the U.L.R.O., Dundee, factories has been commenced, and should be substantially completed by the end of the year. The Dundee factories will concentrate primarily on gearing, heavy and very heavy machine tools and contract work for heavy equipment. The Leeds factory will be engaged primarily on textile machinery, including a number of new specialized machines in an advanced state of development or already released for sale, light engineering products, and light and medium machine tools.

Every effort will be made to avoid temporary redundancy during the change-over. The directors believe this reorganization will provide future full employment for most of the present employees, and eventually will require an increased labour force.

VILLIERS ENGINEERING COMPANY, LIMITED—Mr. George Teasdale has been appointed London director in place of Mr. Christopher C. C. Bridge, who has resigned from the board.

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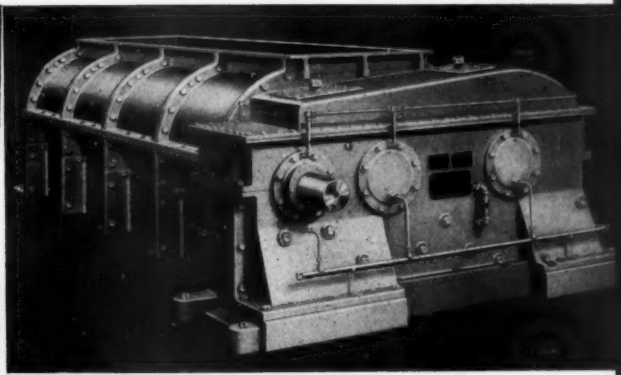

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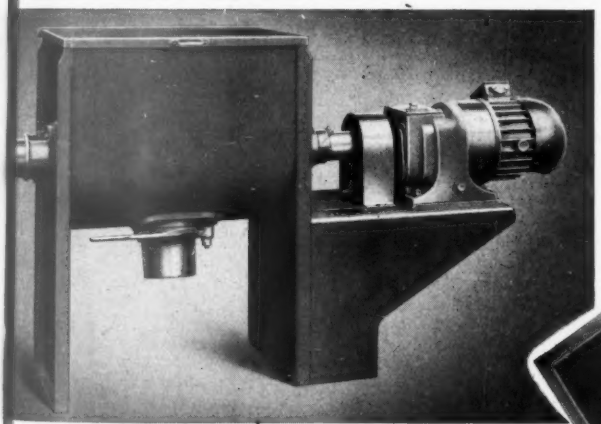

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

October 31, 1956

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £17 11s. 0d.; Birmingham, £17 3s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £20 8s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £20 12s. 3d.

Scotch Iron.—No. 3 foundry, £21 14s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £23 16s. 6d.; South Zone, £23 19s. 0d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £25 4s. 0d.; South Zone, £25 6s. 6d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent. :—N.-E. of England (local iron), £21 7s. 6d.; Scotland (Scotch iron), Zone S. 1, £21 14s. 0d.; Sheffield, £22 14s. 6d.; Birmingham, £23 2s. 0d.; Wales (Welsh iron), £21 7s. 6d.

Basic Pig-iron.—£18 3s. 0d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £48 0s. 0d. to £50 5s. 0d., scale 16s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £70 0s. 0d. to £73 2s. 6d., scale 16s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 27s. 6d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 12s. 3d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £250 0s. 0d.; 38/40 per cent., £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 15s. 8d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 18s. 8d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent. C, £93 10s. 0d. to £95 0s. 0d., basis 60 per cent. Cr, scale 29s. 9d. to 32s. 0d. per unit; over 6 per cent. C, £92 10s. 0d. to £93 0s. 0d., basis 60 per cent. Cr, scale 29s. 9d. to 32s. 0d. per unit; 2 per cent. C,* 2s. 1d. per lb. Cr; 1 per cent. C,* 2s. 1½d. per lb. Cr; 0.15 per cent. C,* 2s. 2½d. per lb. Cr; 0.10 per cent. C,* 2s. 2¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £249 0s. 0d.; 96/98 per cent., £259 0s. 0d. to £265 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 22s. 6d. to 23s. 6d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £68 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £28 19s. 0d.; tested, 0.08 to 0.25 per cent. C, £29 19s. 0d.; basil (0.41 to 0.60 per cent. C), £31 0s. 6d.; silico-manganese, £39 10s. 0d.; free-cutting, £33 3s. 0d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £36 14s. 6d., silico-manganese, £39 17s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £34 13s. 6d.; basic, hard, over 0.41 up to 0.60 per cent., C, £35 16s. 0d.; acid, up to 0.25 per cent. C, £38 17s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £35 7s. 0d.; boiler plates (N.-E. Coast), £37 17s. 0d.; floor plates (N.-E. Coast), £36 16s. 0d.; sectional material, N.-E. Coast, £33 16s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested (4-ton lots), £36 3s. 0d.; flats, 5 in. wide and under (4-ton lots), £36 3s. 0d.; hoop and strip, £36 12s. 6d.; uncoated strip mill coils, not rolled, under 3mm. to 12g., £38 16s. 0d.; black sheets (hand mill), 17/20 g., £50 4s. 6d.; galvanized corrugated sheets, 24 g., £62 2s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £61 13s. 9d.; nickel-chrome, £85 10s. 6d.; nickel-chrome-molybdenum, £96 16s. 6d.

NON-FERROUS METALS

Copper.—Cash, £297 0s. 0d. to £298 0s. 0d.; three months, £298 0s. 0d. to £298 10s. 0d.; settlement, £298 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 7⅝d. per lb.; rods, 306s. 3d. per cwt. basis; 20 s.w.g., 339s. 6d. per cwt.

Tin.—Cash, £885 0s. 0d. to £890 0s. 0d.; three months, £832 10s. 0d. to £835 0s. 0d.; settlement, £890 0s. 0d.

Lead (Refined Pig).—Second half October, £118 10s. 0d. to £118 15s. 0d.; second half January, £117 5s. 0d. to £117 10s. 0d.

Zinc.—Second half October, £99 15s. 0d. to £100 10s. 0d.; second half January, £96 15s. 0d. to £97 0s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £129 0s. 0d.; rolled zinc (boiler plates), all English destinations, £126 15s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £110.

Brass Tubes, etc.—Solid-drawn tubes 2s. 2½d. per lb.; rods, drawn, 3s. 1½d.; sheets to 10 w.g., 298s. 3d. per cwt.; wire, 2s. 10⅝d.; rolled metal, 283s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £193; B6 (85/15), — ; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £238; HTB2 (38 tons), £245 HTB3 (48 tons), — .

Gunmetal.—BS RCH, — ; BS1400, LG2 (85/5/5/5), £265; LG3 (86/7/5/2), £273; G1 (88/10/2/½), £325; (88/10/2/1), £314.

Phosphor Bronze.—BS1400, PB1 (AID released), £340 per ton.

Phosphor Bronze Strip, etc.—Strip, 412s. 0d. per cwt.; sheets to 10 w.g., 436s. 6d. per cwt.; wire, 4s. 3½d. per lb.; rods, 3s. 7¾d.; tubes, 3s. 6d.; chill cast bars: solids 3s. 7½d., cored 3s. 8½d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 11d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 3¾d.; special quality turning rod, 10 per cent. ½ in. dia., in straight lengths, 4s. 2¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 4d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £83 10s. 0d. Nickel, £519 0s. 0d. Aluminium ingots, £198 10s. 0d.; aluminium bronze (BS1400) AB1, £275; AB2, £291. Solder, brazing, BS1945, type 9 (50/50), 3s. 1d. per lb., type 9 (54/46), 3s. 4½d. per lb.

* Average 68–70 per cent.

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CENTRAL: 9969.

Public Works and Municipal Services Exhibition

A considerable number of new products will be introduced at the Public Works and Municipal Services Exhibition which opens at Olympia, London, on Monday, November 12. The size and scope of the exhibition is bigger than ever; for the first time since it was inaugurated in 1919, the entire space at Olympia will be occupied; there being 366 stands (275 in 1954) providing a complete survey of equipment required by Municipal and Local Government services both at home and abroad. The trend is towards larger and more powerful machines than were available two years ago when the exhibition was last held, many manufacturers, however, have concentrated on improving design, reliability and general performance of their established models. Foundry products will be well represented and brief details of a few of the exhibits of major interest to visiting foundrymen are given below:

ENGINES on show in the Dorman K. & L. series of industrial diesels, of which many parts are interchangeable, cover a power range of 18 to 240 b.h.p. (stand 66).

E. ALLMAN & COMPANY, LIMITED, offer a portable fire-fighting unit which is completely self-contained with hoses, fog gun, body and face protecting jets. (stand 235).

Among the new products of Winn & Coales, Limited, is the Denso tape and paste used for the protection of pipelines, cables, couplings, structural steelwork, etc. (stand 242).

INCLUDED in the display of 1 to 6 b.h.p. B.S.A. petrol, vaporizing oil and power paraffin engines is the newest and smallest addition to the range—a 98 c.c. model (stand 194).

BLAW KNOX, LIMITED, have many new products on show including a range of Cleanline concrete mixers, and a crawler crane equipped with an independent power boom hoist (stand 113).

BRITISH STRADDLE CARRIER COMPANY, LIMITED, will exhibit their self-loading and unloading straddle carrier—Steelmaster diesel model 4754 MK 1A with crane attachment (stand 145a).

SWINTON under-draught and convector fires, embodying modern requirements for the efficient and economical use of solid fuel, will be shown by Hattersley Bros., Limited (stand 265).

MANY IMPORTANT new design features have been incorporated in two up-to-date versions of the Winget Limited's 10 NT non-tilt mixer which are included in the full range of tilting drum and non-tilt mixers shown on stand 53.

POWER HACKSAWS claimed to be the smallest and cheapest in the world are offered by W. Kennedy, Limited. The operating cost is less than a penny an hour, and they weight only 40 lb. (stand 210).

BERGO, LIMITED, introduce their latest development —a Bollard adapted for use in fog. Plastic sleeves for banding 3-in. dia. traffic signposts, resistant to weather and acids, will also be on view (stand 97).

AIR FILTERS for air-conditioning installations in all classes of buildings will be shown by Vokes, Limited. The range includes sub-micron types for atomic energy research and power establishments (stand 89).

A RANGE of street nameplates and warning signs in cast silicon/aluminium alloy, together with an almost indestructible portable collapsing sign are among the features of the I.R.S. display (stand 255).

THE CENTRE OF INTEREST on the Climax Rock Drill stand will be the recently introduced deep-hole Vole drill—an ideal rig for use in quarries. The drilling speed at depth is the same as at the surface (stand 32).

AMONG the seven new machines to be seen on Frederick Parker's stand are a giant tarmacadam plant; mobile sand- and gravel-handling plant; and new developments in rock crushers and concrete mixers. (stand 25).

THE EXHIBITS in the display of Remington Rand, Limited (stand 245) include a 1/12 scale model of the Remington Rand Univac electronic computer, an electric typewriter which can produce up to 20 clear carbons, and the new Ultravox dictating machine.

RANSOMES & RAPIER, LIMITED, are showing the new ¾-cub. yd. excavator with dragshovel, four-purpose equipment, which can be arranged as shovel, dragshovel, skimmer or crane. New concrete mixers and pumps are also included in this display (stand 45).

THE MAIN EXHIBIT from Goodwin Barsby & Company, Limited, is the Goliath mobile gravel plant of new design; capable of an output between 120 to 150 tons per hour. Also shown for the first time is the Accra-Batch, a small compact unit for batching granular materials (stand 71).

THE following machines will be shown by F. E. Weatherill, Limited: the 4HTW-type two-way overloader; the 2HHCR-type Hi-tip and 2HCR "q"-type hydraulic loading shovels, and the latest version of their front-end loading shovel together with the new rear-mounted trenching attachment (stand 68).

FRACTURED cylinder blocks repaired by a cold repair process will be shown by Metalock (Britain), Limited, and a demonstration casting will show the various stages of a repair. Also on the stand will be portable equipment, demonstrating the Furmanite method of sealing steam leaks under pressure, without shut-down. (stand 188).

AIR COMPRESSORS: A special feature of Bristol Pneumatic Tools, Limited, in this display is the Duplex two-stage airflow-cooled diesel-engine powered portable air-compressor. Oil-flooded rotary air-compressors will be found on the stands of Broom & Wade, Limited, and Consolidated Pneumatic Tool Company, Limited (stand Nos. 146, 20 and 59).

SEVERAL FIRMS are this year introducing bigger-than-ever models of dumpers. These include the A.E.C. and Foden six-wheeled vehicles, a Scammel four-wheeled model, and the Euclid BITD model of 22-ton capacity, shown by Blackwood Hodge & Company, Limited (stand Nos. 61a, 152, 36 and 73). Another dumper on show is the Nimbus lightweight, a four-wheeled vehicle shown for the first time by Thwaites Agricultural Engineering Company, Limited (stand 106).

THERE IS FURTHER EVIDENCE of the inroads plastics are making into fields hitherto catered for by cast and wrought metals. For instance, a number of firms including Thomas de la Rue & Company, Limited, I.C.I., J. S. & J. Folkard, Limited, are showing plastic acid-resisting pipes for cold-water services. Hydrants, control valves and road signs can also be found in the exhibition. The Surfex Flooring Company, Limited, are among the firms displaying industrial, office and domestic flooring in various types of plastics.

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are

* *Economical*

* *Fireproof*

* *Durable*

* *Rigid*

* *Light*

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Personal

British Transport Commission announce the appointment of the Hon. ANTHONY G. BERRY and Mr. P. T. HEADY as members of their Western area board.

Mr. ARNOLD PROUD, who has been works manager of Henley Foundries, Limited (formerly Oakley Bros., Limited), since 1946, has been appointed a director as from September 26. He retains his appointment as works manager.

Mr. NORMAN MCKINNON WOOD, managing director of Griffin & George, Limited, the laboratory furnishers, and chairman of the British Laboratory Ware Association, sailed from Liverpool last week on a visit to the United States of America.

Mrs. AUBREY JONES, wife of the Minister of Fuel and Power, on October 23 launched the 38,000-ton Zenatia, the largest tanker yet launched on Merseyside and the largest unit under the British flag in the Shell unit. The Zenatia is being built by Cammell Laird & Company, Limited.

Mr. A. G. STEWART, chairman and general managing director of Stewart and Lloyds, Limited, has been appointed by the President of the Board of Trade to be a part-time member of the Iron and Steel Board in place of Sir Andrew McCance, who at the end of his period of office on May 31 last did not seek reappointment.

Mr. CLIFFORD SHAW, of Zirconal, Limited, leaves for the United States and Canada on November 3, to attend the inauguration of Zirconal Development Corporation, promoted through the British Industries Corporation, Fort Washington, N.Y., to begin making refractories in the United States and Canada. Mr. Shaw is also meeting Shaw Processes licencees, now numbering six, in the United States.

Mr. J. O. BOWLEY has been appointed a director and general manager of A.E.C., Limited. Mr. Bowley, who joined A.E.C. in 1926, resigned after 24 years with the company and subsequently served with Guy Motors, Limited, and the Ministry of Supply, rejoining A.E.C. in 1955 as general works manager. Mr. GEORGE D. ROBINSON, who has been chief engineer since 1950, has also been appointed to the board.

A paper read by Mr. P. JACKSON to the Massachusetts Institute of Technology in Boston, and later to the Institution of Mechanical Engineers in London, has been awarded the institution's Herbert Ackroyd Stuart Prize. Mr. Jackson, who is manager of the research and development department of William Doxford & Sons, Limited, Sunderland, dealt with the supercharging of the Doxford engine and combustion problems in large diesel engines.

Mr. TOM THOMAS, who retired recently from his post as chief wages clerk and negotiator at the Ebbw Vale works of Richard Thomas & Baldwins, Limited, was said to be " one of the greatest men the iron and steel industry has ever seen," by Mr. Harry Douglass, secretary of the Iron and Steel Trades Confederation. At a dinner held in his honour the No. 4 branch of the British Iron, Steel and Kindred Trades Association made presentations to Mr. Thomas.

Mr. HAROLD HUMPHRIES and Mr. W. JENKINS GIBSON, deputy chairman and deputy managing director, respectively, of Millspaugh, Limited, have left for Canada and the United States, in connection with the further development of the activities of their Canadian companies in the pulp and paper industry of Canada. Mr. Humphries will also have important discussions in New York affecting the Hadfields group of companies. These discussions will aim at further extending these companies' sales of their products in the United States of America.

Mr. J. H. TRICKEY, engineer-in-charge (marine) of Ruston & Hornsby, Limited, Lincoln, is retiring after 25 years' service with the company. He has been closely associated with the development of Ruston marine engines and, working with the late Mr. O. Wans, the company's engineering director until 1951, was concerned with the widespread adoption of diesel propulsion for fishing and larger vessels. Following Mr. Trickey's retirement, Mr. P. H. HYLTON becomes manager, marine department; Mr. P. F. DILNOT becomes marine installation manager, and Mr. R. L. RAWLINGS becomes engineer-in-charge, marine installation department.

Obituary

The death is reported of Mr. JOHN BOYLE, a partner in Sloan & Davidson, Limited, ironfounders, of Leeds. He was a grandson of one of the founders of the firm, the late Mr. J. Davidson.

A director and former deputy chairman of British Insulated Callender's Cables, Limited, Mr. PHILIP VASSAR HUNTER, who in 1939 invented the buoyant cable for use against magnetic mines, died on October 22. He was 73.

Mr. RONALD OSMAN SHAW, joint managing director of Francis Shaw & Company, Limited, rubber and hydraulic engineers, of Manchester, was killed in a road accident recently. Mr. Shaw was returning home from a business journey. An authority on rubber and plastic machinery manufacturing, he made the first plastic fusion machine for a substance then called Mipolam, now known as PVC.

Mr. CHARLES BENSON WARDMAN, who claimed to have introduced diesel engines into this country, has died at the age of 72. He became managing director of Lea-Francis Cars, Limited, Coventry, and Vulcan Motors, Limited, Southport, and he founded, at Leamington in 1937, his own vehicle and aircraft components firm of Kigass, Limited. He was also chairman and managing director of Air Industrial Developments, Limited, Shenstone, Lichfield.

Changes of Name

AMONG the companies which have recently changed their names are those listed below. The new titles are given in parentheses.

DIXON POWNER (TOOLS), LIMITED, Coal Road, Seacroft, Leeds, 14 (Dixon Powner & Sons, Limited).

VARIABLE SPEED PUMPS, LIMITED, 14, Stamford Street, Stalybridge (Acres Bank Properties, Limited).

LAND PYROMETERS, LIMITED, Norfolk Chambers, 9, Norfolk Row, Sheffield, 1 (Dore Investments, Limited).

BALLIN DIE-CAST & ENGINEERING COMPANY, LIMITED, 118, Gravel Lane, Wilmslow, Ches (Hughes & Mather, Limited).

SMITHBROOK ENGINEERING COMPANY, LIMITED, Smithbrook, Chapel-en-le-Frith (George Ibbotson & Sons, Limited).

KIMBELL REFRIGERATION DEVELOPMENTS, LIMITED, 146, Grosvenor Road, London, S.W.1 (Kimbell Machine Tools, Limited).

F.N.F., LIMITED, textile machinery manufacturers, etc., of Burton-on-Trent (F.N.F. Machinery Manufacturing Company, Limited).

SYDUN CONVEYOR MANUFACTURING COMPANY, LIMITED, 24, Basinghall Street, London, E.C.2 (Sydun Manufacturing Company, Limited).

A. HENSHAW & SONS, LIMITED, machinery and metal merchants, etc., of Railway Street, Stockport, Ches (Albert Henshaw & Sons, Limited).

DINDORE PRODUCTS, LIMITED, engineers, etc., of Phoenix Works, Great West Road, Brentford, Middx (Victoria Instruments, Limited).

NICHOLSON & WEST, LIMITED, mechanical, gas, and electrical engineers, etc., of 3/15a, Gaol Lane, Halifax (Smith, Nicholson & West, Limited).